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# The Role of the Environment Action Programmes of European Union in the Development of EU Environmental Policy

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The European Union by its sui generis character of supranational structure having its own law and institutions as a power above national states, has aimed the integration target while developing environmental policies like other policy fields. 1970s were the awareness period of environmental degradation for the sake of economic development in the world. That period also became awakening years for the European Union from the perspective of environmental protection. EU Member States have become to take common actions in environmental issues like other many fields. The Second World War did not only damage human and economic capacity of the European Continent but also deteriorated the European environment. Not much later of the establishment of the European Economic Community, EU introduced many legal and administrative arrangements from preventive to protective.

Environment action programmes have been the basis for the European Union in order to develop its environmental policies. EU has introduced seven environment action programmes so far. Each of them covers a specific period of time. While the first programme was covering the period of 1973 - 1976, the final (seventh) programme covers the period of 2014 - 2020.

**Key words** 

Environment, Environment Action Programme, European Union

#### 1. INTRODUCTION

As a power above national states with own law and institutions of European Union (EU), with the nature of supranational, has pursued a goal of integration on forming environmental policies just as in other fields [1]. 1970s that a period of realizing of the destruction of environmental values worldwide in sake of economic development are "awakening" years in EU in terms of environmental protection. EU countries, as on many issues, have begun to move together on the environment. The main reasons of this are as follows:

- Adopting different environmental policies and standards by member states, lead to unfair competition, thus creating obstacles to the realization of the common market
- Improving the living conditions and raising the quality of life in Member States on a common level
- Understanding of the obligation to act together by interdependence of neighbouring countries and the spread of pollution from a country to another one with a transboundary character [2].

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In parallel with global developments, EU prepared "Environment Action Programmes" in which shed light on the principles and priorities of environmental policy are determined so that will be a roadmap for the years ahead. Although there is no binding effect, Environment Action Programmes reveal main principles of the policy to be followed in union wide and are being guidance for prospective legislation [3].

#### 2. ENVIRONMENT ACTION PROGRAMMES

In the EU, six action programmes have been conducted so far. The duration of the Sixth Environment Action Programme was expired in July 2012 [4]. European Commission prepared the proposal of the Seventh Environment Programme, and Parliament and Council approved the Programme. Seventh Environment Programme which will be valid until December 31 2020 was published in the Official Journal the EU on 28 December 2013.

#### 2.1. First Environment Action Programme (1973-1976)

Just after "United Nations Conference on Human Environment" which was held on June 5-16, 1972, Heads of State or Government of the EU member countries who came together in Paris on October 19-20, 1972 requested from relevant institutions to prepare "Environment Action Programmes" until July 31, 1973 by making a statement for the first time about environmental protection. The Programme that was prepared by Commission, namely "First Environment Action Programme" was adopted by Council on November 22, 1973 and has been put into force with the approval of the Member States [5].

First Environmental Action Programme revealed purposes and principles of the Environmental Policy of the Union and gave a long list of numerous measures should be taken at Community level. This programme searched out a solution on especially important and serious pollution problems.

Some of the targets set in the First Environmental Action Programme could be summarized as follows:

- Reducing and if possible, preventing the pressure on environment,
- Preserving ecological balance and biosphere,
- Avoiding use natural resources in such a way damage to ecological balance,
- Improving the working and living conditions,
- Further consideration on environment in urban and regional planning,
- Seeking common solutions on environmental problems with non-member states of Union and in particular international organizations [6].

It is understood that this programme that specifies general purpose of environmental policy as improving the life quality of individuals and their environment and living conditions, was determined in accordance with principles set in Stockholm Conference such as preventing the pollution at source, including the environmental concerns to all planning and decision-making processes, admitting the principle of "polluter pays", taking into consideration of the impact of union policy on developing countries and developing the international cooperation [7].

#### 2.2. Second Environment Action Programme (1977-1981)

Second Environment Action Programme that was launched in 1977 is a continuation of the First Programme. In the section of purposes and principles of this programme, the purposes and principles of the First Programme was adopted and the view of which issues should be continued are reducing, preventing and if possible abolishing the pollution; disallowing use in such a way damage to ecological balance; further consideration on environment in urban and regional planning and cooperation with international organizations, was given place. Likewise in Second Programme, it was provided that the characteristic of environmental policy became inhibitor rather than troubleshooter by requesting on environmental policy the implementation of environmental impact assessment (EIA) [8].

First two environment action programmes of the European Union included targets for the purposes of providing immediate solutions to serious problems which were emerged as a result of pollution and can be described as restorative policies [9].

#### 2.3. Third Environment Action Programme (1982-1986)

The third Environment Action Programme which was enacted in 1983 clarified its environmental approach and accelerated the development of that policy thinking. In this programme is based on a conservative approach and environmental resources has been recognized as the most important element of further economic and social development. Under this protective ideas and approaches, it is aimed to prevent the emergence of potential environmental problems. Therefore, it emphasized that it is an integral part of economic planning and operation of environmental needs. In this programme, in environmental policy, it is necessary to solve the problems with existing

pollution prevention at the source. In addition, the requirement of rational use of natural resources as well as protection, indicating that the basic policy of conserving natural resources is emphasized [10].

In the introduction part of the programme, by considering the protection of the Mediterranean for the first time, it was stated that the protection of the Mediterranean would contribute to peace in the region as well as economic, social and cultural values.

#### 2.4. Fourth Environment Action Programme (1987-1992)

In the fourth Environment Action Programme, covering the period 1987-1992, The Single European Act, which entered into force on 1 July 1987, the projected foreseeing the development and implementation of the Union's environmental policy it was emphasized that environmental protection is a requirement of the economic and social development. Some of the topics that have been elaborated in detail in this programme are given below:

- The development of policies on the environment and avoid any kind of pollution that endanger human health
- Identification of appropriate strategies in the management of natural resources
- Moving to international cooperation in environmental protection
- Effective implementation of the EIA Directive dated 1985 and the development of appropriate tools, such as raising the awareness of the public

The fourth programme is of particular importance in terms of the coverage period provided for the creation of the European internal market. Because one of the barriers (technical barriers) in the internal market was about the environment. Therefore, in the fourth programme, it was emphasized that to produce high quality products and services and without creating pollution is required both the creation of the European internal market and to be competitive in international markets [11].

#### 2.5. Fifth Environment Action Programme (1993-2000)

With the main theme "Towards Sustainability" and implemented during the period 1993-2000, the basic framework of the Fifth Environment Action Programme was determined by the idea of integration of the environment to economic and social development policies. It is also main idea of the United Nations Conference on Environment and Development which was held in Rio in 1992. Objectives of the Fifth Programme can be outlined as follows:

- The principle of sustainable development,
- Responsibility is shared by all sectors,
- Industrial, energy, transport, placing a special emphasis on agriculture and tourism sectors,

With the aim of the realization of the sectoral integration with the most important elements are prominent in Action Programme, the first four programmes discussed in this programme while maintaining the validity of legal instruments as the basis, so far these are the protection of the environment by emphasizing that they are not at the desired level of effective legal instruments economic instruments for environmental management as well as environmental impact assessments, management systems and product policies such as the implementation of new approaches is foreseen. For this purpose the traditional measure and control tool in the Union's environmental policies and the fifth programme, it is seen to be a shift to market-based economic instruments. such as carbon taxes and voluntary agreements (Eco-label) [12].

- Basic environmental issues covered in this programme include:
- Climate change,
- Acidification and air quality,
- Nature conservation and biodiversity,
- Management of water resources,
- The urban environment,
- Coastal areas,
- Waste management.

In the Fifth Action Programme, local governments were considered important especially in terms of environmental protection authority. Citizens, non-governmental organizations, professional associations, private sector representatives were considered as actors of environmental policy [13].

In addition to these issues in the programme, issues on risks arising from industry and chemicals such as industrial accidents, nuclear safety, radiation protection and environmental emergencies goals and principles have been identified. The most important feature of this new strategy; All decisions relating to the Union's

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environmental and sustainable development, and implementation of action, ensuring the widest possible degree of citizen participation and the decisions of the transparency principle is expected to take place in an appropriate manner. For this purpose, it is seen that there has been special attention to shared responsibility in general among the Union/national or regional government/local or regional government/entrepreneurs/consumers [14]. In the fifth programme, the concept of sustainable development has also been raised for the first time.

#### 2.6. Sixth Environment Action Programme (2001-2010)[15]

The slogan of Sixth Environment Action Programme, which was planned to span between years of 2001-2010 but concluded in July 2012, was defined as "Environment 2010: Our future, Our Choice". At a first glance it seems to have a longer term rather than its predecessors, as it's designed to cover a 10 years but lasted 12.5 years. The Programme emphasise that it doesn't just target to preserve the environment for ourselves and future generations but also aims to improve citizens' life standards. Targets were set in four different areas to meet demands for basic environmental priorities by this programme. Some of these targets were scheduled. These areas are as below:

- 1. Climate Change: To be a part of Kyoto Protocol in 2002 and to fulfil the commitments of decreasing the amount of greenhouse gases by %8 related to their 1990 levels between years of 2008-2012 according to 1998 Council Decisions. To reach this target, it is envisioned to take reducing measures in main sectors like energy, industry, transportation and fields like building heating systems, agriculture and waste management. In the evaluation of Sixth Programme which can be found in Commissions webpage for Draft of Seventh Programme, it is stated that this objective will be exceeded by 2012.
- **2. Nature and Biodiversity:** Protection and restoration of natural systems functions, preserving biodiversity both in the Union and global level, protection of soil against erosion and pollution. Again, the evaluation of Sixth Programme stated that total ratio of Natura 2000 sites in comparison with total Union area were reached to %17, yet target for decreasing loss of biodiversity couldn't be reached by 2010 and "Soil Framework Directive" couldn't come into force.
- **3. Environment and Health:** To achieve a quality of the environment which does not give rise to significant impacts on, or risks to, human health and environment. In the evaluation of the Programme, it was stated that "2004-2010 Environment and Health Action Plan" was helpful for raising public awareness for air, water pollution and chemicals; comprehensive legislation have been implemented about chemicals, pesticides and water; and there is a decrease in levels of SO2 (sulphur dioxide), NOx (nitrogen oxides) and amount of lead in air.
- **4. Natural Resources and Wastes:** To ensure that the consumption of renewable and non-renewable resources does not exceed the carrying capacity of the environment. Preventing wastes and increasing efficiency of resource consumption for economic development in the first place. In the evaluation of the programme, it was stated that the bond between waste policy and resource policy have been strengthened; waste management gained strength and policies for sustainable consumption and productivity are successful.

In the new Programme some strategic approaches defined to make a progress in these related fields. These are shortly:

- Showing an innovative approach in environment policy and seeking new ways for cooperation with the large segment of the society,
- Improving implementation of current environment legislations,
- Deepening the harmonization of environment policy with other policies,
- Developing further sustainable production methods and consumption habits,
- Providing qualified and accessible information to shape (and affect) citizens conception and behaviour about environment
- Ensuring protection and improvement of environment in Member States' decisions in the field of land usage and management

This new Programme represents the environment stage of Union's sustainable development strategy, and also emphasises that all parts of society must actively involve and take responsibility to develop innovative, applicable and sustainable solutions regarding to encountered environmental problems.

Another issue taken into account by Sixth Environment Action Programme was that Environment 2010 will include a time phase which new member states will join EU. As Central and Eastern European Countries with Malta and Greek Cypriot State becoming Member States, EU will gain an additional population of 170 million and enlarge its land area by %58. This situation brings up a special condition that, these new Member States will have unexploited natural structure and rich biodiversity in addition with new environmental problems which EU will need to overcome. In this regard, it is foreseen that this new programme shall have an important function to solve environment problems of new Member States which will join to the Union.

#### 2.7. Seventh Environment Action Programme (2014-2020)[16]

The slogan of the 7th Environment Action Programme is "Living Well Within the Limits of Our Planet", and it aims 31 December 2020, adopted by the European Parliament and Council, and published in the Official Journal of the EU on 28 December 2013. It can be seen that, the economic crisis and the employment problem encountered in many EU Member States became very important in developing this programme.

It is stated that the programme is based on polluter pays principle, precautionary principle, preventive action principle and the principle of environmental pollution should be rectified at source.

The need for public institutions in all levels to work together with business world and social cooperatives, civil society and individual citizens in implementation of the programme is emphasized.

It is stated that the implementation the programme will be monitored by the Commission. It is envisaged that this monitoring will be before 2020, should be based on the Environment Status Report of European Environment Agency and sharing these information's with the public opinion.

The 7th Environment Action Programme has been prepared by taking into account the four issues listed below:

- 1. Although there are developments in some areas, the important environment problems still exist.
- 2. The Europe 2020 Smart Sustainable Inclusive Growth Strategy, which guides the development of Union's 2020 Policies, is ratified.
- 3. Many Member States are in economic crisis so that the need for the structural reforms will bring new opportunities for European Union transition to an inclusive green economy
- 4. The Rio+20 emphasized the importance of global extent.

The 7th Environment Action Programme aims to contribute an environment policy where the Union's natural capital is protecting and enhancing, the health and welfare of the citizens is protecting and the resource-efficient low-carbon economy is envisaged. With determining 9 priority objectives for EU and Member States to achieve, the Programme determines an inclusive framework for the 2020 environment policy. These 9 priority objectives are listed below.

#### 1. To protect, conserve and enhance the Union's natural capital

It is stated in the programme that, the natural capital includes ecosystems that provide essential goods and services, from fertile soil and multi-functional forests to productive land and seas, from good quality fresh water and clean air to pollination, food control and climate regulation and protection against natural disasters. It is also emphasized in the programme that, according to current considerations, the biological diversity of EU has decreased and many ecosystems have experienced serious damages. It is stated in the programme that, the water quality, marine environment, air quality, soil quality are not at the desired levels. So, the listed actions are envisaged in the programme by 2020:

- The decrease in biological diversity and the damage in ecosystems will be stopped and ecosystems will be protected and enhanced
- The impacts of the pressures on clean, transboundary and coastal waters will be decreased to a great extent
- The pressures on sea waters will be decreased
- The impact of air pollution on ecosystems and biological diversity will be decreased
- The Land at the Union level will be managed sustainably, the soil will be protected enough and the polluted areas will be cleaned.
- The nitrogen cycle will be managed more sustainable and resource-efficient
- The forests will be protected.

#### 2. To turn the Union into a resource-efficient, green and competitive low-carbon economy

It is seen as the most important objective that reflects the soul of 7th Environment Action Programme. A solution is sought by using the sources efficiently and effectively within the frame of the "competitive" and "innovation approaches, for the economic crisis in the Union and the unemployment problem in parallel with this. For this purpose, with referring to the Union's "2020 Resource-Efficient European Strategy"; by means of using all resources, separating the economic growth from resources and energy usage and its environmental impacts, decreasing the greenhouse gas emissions, strengthen the efficiency, innovation, competitiveness and promoting more energy security; transition of the economy is envisaged. So that, the issues listed below are emphasized:

- To improve environmental technologies where innovation that uses resources efficiently and effectively is required for a competitive economy in the context of rising resource prices and raw material supply constraints.
- Transformation to a low carbon and resource- efficient economy will bring new job opportunities. For example, the renewables sector alone is expected to generate more than 400 000 new jobs by 2020.

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• The need for urgent improvements of efficiency in order to achieve Union's objectives of reducing greenhouse gas emissions 20 % below 1990 levels by 2020, enhancing renewable energy percentage to %20 and meeting the 20 % energy efficiency.

- Since 80 % of environmental impacts arising from the product itself, originate in its design phase, the European Union policy should ensure that priority products placed on the EU market are 'eco-designed' with a view to optimizing resource and material efficiency, and taking into account the recyclability, recycled content and long product lifespan.
- Reach the target of applying green procurement percentage to at least 50 % of public tenders.
- The recyclable types of the wastes generated should gain to economy before going to the landfills. On average, 40 % of solid waste is prepared for re-use or recycled. More than 70 % of solid waste generated in some member countries is recycled, whereas in some member countries landfill 75 % of their municipal waste. In this way, resources will be used better, new markets will be opened, new employments will be created and the dependency on raw material importation will be reduced.
- Resource efficiency should be taken as one of priority subjects in the water sector. In spite of the impact of drought and water scarcity experienced in many regions in Europe, an estimated 20-40 % of Europe's available water is being wasted through leakages in the distribution system.

For this reason, the actions need to be taken under this heading by 2020 are listed below:

- The European Union will met its 2020 climate and energy targets and is working towards reducing by 2050 Greenhouse Gas emissions by 80–95 % compared to 1990 levels. With this, the European Union puts forward a target (2050) that is beyond the year 2020 which is the completion date of this programme.
- The total environmental impact of all major sectors of the EU economy will be significantly reduced and resource efficiency will be increased.
- The total environmental impact of production and consumption in the food and mobility sectors will be reduced;
- Waste will be safely managed as a resource
- Water stress in the European Union will be prevented or significantly reduced.

### 3. To safeguard the Union's citizens from environment-related pressures and risks to health and well-being

It is stated in this objective of the programme that, European Union environment legislation has delivered significant benefits for the health and well-being of the public; however, water pollution, air pollution and chemicals still remain among the general public's top environmental concerns in the EU. It is also stated in this objective of the programme that, a substantial proportion of the Union's population remains exposed to levels of air pollution exceeding World Health Organization (WHO) standards; Access to adequate water quality still remain as a problem in many rural areas in EU; Horizontal chemicals legislation (REACH and CLP Regulations)1 provides baseline protection for human health and the environment but there is still uncertainty about the full impacts on human health and the environment of the combined effects of different chemicals, nanomaterials, chemicals that interfere with the endocrine (hormone) system (endocrine disruptors) and chemicals in products; An estimated %40 of the EU urban population exposed to noise pollution levels exceeding World Health Organization (WHO) recommended levels.

To this end, the actions need to be taken under this heading by 2020 are listed below:

- Air quality in the Union will be significantly improved
- Noise pollution in the Union will be significantly decreased
- Citizens throughout the Union benefit from high standards for safe drinking and bathing water,
- Risks for the environment and health associated with the use of hazardous substances, including chemicals in products, will be minimized.
- Safety concerns related to nanomaterials are effectively addressed

#### 4. To maximize the benefits of Union environment legislation by improving implementation

In this objective of the 7th Environment Action Programme it is stated that, according to a research made in EU in 2011, the costs associated with failure to implement legislation is around EUR 50 billion and in 2009 alone there were 451 infringement cases related to Union environment legislation. Also it is stated that there are differences between member states related to the implementation of the legislation. Hence, it is emphasized that the enhancement of implementation of EU environment legislation in member states should be one of the

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<sup>&</sup>lt;sup>1</sup> REACH: Registration, Evaluation, Authorization and Restriction of Chemicals CLP: Classification, Labelling and Packaging

important priorities in coming years. So, in order to maximize the benefits of EU legislation, it is envisaged to fulfil the matters listed below, by 2020.

- Accessing the explicit knowledge related to implementation of EU environment legislation by the EU citizens
- Enhancing implementation of the determined environment legislation
- Strengthening the respect to EU environment legislation in all management levels,
- Enhancing the support and the trust to EU environment legislation by the EU citizens

#### 5. To improve the knowledge and evidence base for Union environment policy

The visibility of EU environment policy is based on environmental monitoring, data, indicators and assessments related to the implementation of Union legislation including scientific research. Although many progresses have been made in this area, the need for the improvement of reliability in collection and quality of the environmental information and statistics is emphasized. Thus, these listed below are envisaged to fulfil by 2020.

- Policy makers and business man should have a better basis in order to enhance and implement environment and climate policies including measuring costs and benefits
- Improvement of our understanding and ability in assessing and managing newly emerged environmental and climate risks.
- Strengthening the relation between environment and science

#### 6. To secure investment for environment and climate policy and address environmental externalities

In order to achieve the goals of this target, both private and public sectors are needed. At the same time, it is stated that many countries are struggling to cope with the economic and financial crisis and needs economic reforms and the reduction of public debts to move towards a more resource efficient and low carbon economy. Attracting investment is difficult because of the absence of price signals.

The need for reflecting the environmental externalities to the prices and the implementation of the polluter pay principle is stated. In this regard, the issues that should be completed by 2020 are listed below:

- Achieving the environment and climate policy objectives in a cost-effective way and supporting by adequate finance.
- Increasing the private sector funding for environment and climate-related issues.

#### 7. To improve environmental integration and policy coherence

Although integrating environmental protection concerns into other Union policies and activities has been an Amsterdam Treaty's requirement since 1997, it has not been sufficient to reverse all environmentally negative trends in EU wide. In order to achieve many goals in this programme, there is a need for integration of environmental and climate-related considerations into other policies. Effective implementation of the Strategic Environmental Assessment Directive and Environmental Impact Assessment Directives, integration of environmental protection requirements in plans, programmes and projects will be ensured. With this, both environmental impacts will be assessed and the natural capital will be protected and increased.

In order to achieve this goal by 2020, enhancing and implementing the sectoral policies at EU wide and member state level (energy, transport, industry, communication, agriculture, livestock and etc.) in accordance with the environment and climate goals and aims is the concrete target.

#### 8. To enhance the sustainability of the Union's cities

The Union is densely populated and by 2020, 80 % of its population is likely to live in urban and peri-urban areas. Most cities will face a common set of core environmental problems, including low air quality, high levels of noise, water scarcity, floods and storms, contaminated sites and wastes. So there is need for European cities to put environmental sustainability at the core of their urban development strategies. This is in line with the commitment made at Rio + 20 to promote an integrated approach to planning, building and managing sustainable cities and urban settlements.

In order to achieve this objective, implementation of sustainable urban planning and design policies by most of the EU cities by 2020 is defined as a concrete goal.

## 9. To increase the Union's effectiveness in addressing regional and international environmental and climate-related challenges

In this objective of the programme, it is stated that the issues given in other objectives are already the globally or regionally accepted objectives, so with implementing this objective, the EU will be also implementing the global and regional objectives. Some of these are listed below:

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• As accepted in Rio + 20, green economy is an important tool for the realization of sustainable development, and also plays an important role for the healthy environment

- Reducing the greenhouse gas emissions %50 below 1990 levels by 2050
- The global biodiversity targets laid down under the Convention on Biological Diversity (CBD) need to be met by 2020 as the basis for halting and if possible reversing the loss of biodiversity worldwide,

In order to achieve this goal, the listed issues in this programme are expected to be completed by 2020:

- Integration of Rio+20 decisions into EU's foreign policies and contribute to global efforts for the implementation of accepted commitments including provisions in Rio+20 Declaration
- The EU subsidize to national, regional and international efforts in dealing with environment and climate problems and ensuring the sustainable development.

#### 3. CONCLUSION

When each of the action programmes is examined, it is seen that they have brought new problems and discussion areas reflecting the specific conditions of their periods.

In the EU, within the framework of policies dedicated in each period of programme many legal arrangements have been put into force.

First two environment action programmes of the Union mostly cover the actions aiming immediate solutions of the serious problems arisen from the pollution. Restoration characteristic of this approach can also be seen in the third Programme in which preventive approach can also be seen. Fourth Programme by bringing wider perspective to the environmental protection, elaborated the environmental problems as the basic component of economic and social development. Fifth Programme focused on the issue of the responsibility should be shared by all the sectors of society. Sixth Programme was likely the follow-up of the Fifth Programme.

Development of the European Union's environmental policies has been realized by the "Environment Action Programmes" which have been introduced in serial manner. After the enactment of each of the action programme, related legal texts have been put into force at EU level. Whereas first programmes have focused on restorative and preventive characteristics of policies like mitigating the pollution in drinking water resources and in the marine, phasing out lead in gasoline, and limiting the sulphur and nitrogen oxides emissions, following programmes have mainly addressed environmental protection issues in a broader perspective like river basin management, sustainable development, cleaner production, receiving media approach etc. Environmental policy of the EU has followed the path from prevention or mitigating pollution to the rational use of natural resources and conservation them without destruction.

It can be seen that, all action programmes including the last (seventh) programme have aimed at economic growth and welfare of the EU citizens. Anthropogenic environmental protection approach is still dominant in the programmes.

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## Ecological waste management and economic concept of sustainable

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Waste is one of the key problems of modern civilization and the consequences of man's way of life. The modernization of society, expanding and increasing the purchasing power of the population creates an increasing amount of waste which man distorts the natural balance. Resolving the problem of waste is recognized as one of the highest priorities to reduce environmental pollution, and therefore to protect human health, animal and plant life. The fact is that the developed countries have recognized this problem, and it is supported by their legislation and strategic documents in which they provide clear guidance on effective waste management. Basic settings in general are almost everywhere identical: to produce as little waste as possible, reuse or recycle as much as possible, develop and apply new technologies, materials or energy, and finally the rest disposed of in an environmentally acceptable way. In order to protect the ecosphere and all components of the environment (water, soil, air, flora and fauna, landscapes, built environment), environmental policy in the Republic of Srpska (BiH) must be based on international conventions. Achieving the goals of environmental protection from the damaging effects of waste must be done to prevent pollution and reduce the effects on human health and the environment.

#### **Key words**

Environment, Sustainable Management, Waste

#### 1. INTRODUCTION

Resolving the problem of waste is recognized as one of the highest priorities to reduce environmental pollution, and therefore to protect of human health, animal and plant life. The fact is that the developed countries have recognized this problem, and it is supported by their legislation and strategic documents in which they provide clear guidance on effective waste management[1].

Basic settings in general are almost everywhere identical: to produce as little waste as possible, reuse or recycle as much as possible, develop and apply new technologies, materials or energy, and finally disposing the residue in an environmentally acceptable way.

The amount of waste is growing while the infrastructure which should deal with waste is not sufficient. The waste management system doesn't function completely, and the regulations establishing the waste management have not been implemented completely. System which is disturbed in that manner has negative effects on the parts of ecosystem such as water, air, soil, climate, human health and other living world. The underground waters have been endangered as they are the main source of drinking water storage supply and the basic national resources. By continuing with this undesirable practice we will face with a huge risk for greater and more serious consequences for

health. Increasing pollution and losing surface waters will demand the expensive procedures of purification and remediation of the waters and soil.

The problem of waste cannot be successfully overridden with only one technology but with the mixture of greater number of available technologies. This approach, coloured with the sustainable development philosophy, is contained in the whole or integral management of the waste, based on the concept[2]:

- **A**–**A**void (reduction) of the waste
- E- Evaluation (using) of the unavoidable waste
- R-Removing (processing and disposing) of the remaining waste.

By this ecological-economic concept the priority is given to the prevention in the waste production, separate collection, material and energy recycling of the unavoidable waste (advanced technologies).

#### 2. MATERIALS AND METHODS

#### 2.1. The waste management

The waste management is a complex activity covering all economic branches, production and consumption, and contains the series of procedures and technologies using most of them indifferent forms.

The Six Action Programme for the Environment Protection – "Six environment action programme 2010: our future, our choice", adopted in 2001 represents the stand point of the European Commission for Environment Protection, and within its new initiative on waste for the first decade of the 21st century[3]. Increased consumption and the change in the life style will additionally burden already overburdened waste management systems and communal infrastructure. That is why, altogether with the improving of the existing waste management systems, the priority will be given to the investment into the initiative to avoid the production of waste, recycling and the infrastructure development.

Based on the continuing of the present approach, the Programme gives special attention to the need for the significant improvement of the implementation of the existing measures in the member-states. As the local governments are often those carrying the burden of the implementation of the demands of EU legislature on waste, the Commission is intending to improve their inclusion in the preparation of the legislature and supporting the mutual exchange of experience and the best practices.

The aims of the EU waste management policy contained in the Programme state that the main aims are to achieve the condition in which waste is non-hazardous or represents very low risk for the environment and health; and is reintroduced in the economic cycle by recycling or is returned to the environment in a useful way such as compost[3]. The Six Action Programme has planned to adopt seven new strategies for the priority areas of the environment protection in which the most important strategy is prevention of waste and use of waste[3].

The management of the waste is a complex system with a large number of activities, which are in most cases, interdependent. The time when the waste management system was composed of two main parts: the collection and disposal are gone by. The waste, by definition, represents non useful and undesirable product, and is made as a result of the human activity, and the whole waste management system is composed of series of the following elements:

- waste production, evaluation the amount of waste and the possibility of the reduction in waste production,
- waste handling and separation include all waste activities until disposed into the garbage bin or waste collection container,
- waste collection includes all activities from collection and transport of waste to unloading vehicles for further waste processing as the secondary raw-material, readjusting for the use as energy source and disposing,
- waste separation and processing include processing of collected materials; conducted mostly in remote sites far from the location where it was generated,
- waste transport includes transport and reloading collection vessels and containers where waste is temporary stored in bigger transport equipment, and also transport to the distant locations for processing or disposal sites.

The whole waste management system includes all these intertwined elements; also evaluation of their functionality, economic advantages and their inter-relation in order to achieve the goal for establishing the efficient system. The system is defined as a choice and the use of existing techniques, management, programmes, and requires careful planning of the material flow from natural resources, production and consumption to the impact on the environment, whether positive or negative.

(Figure 1)[4]

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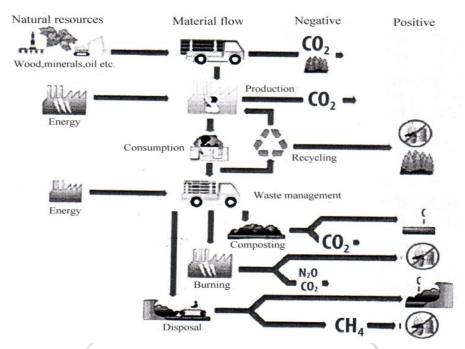


Figure 1. Portrayal of the life cycle of the material (Source: EPA, 2005)

#### 2.2. The waste economy as the precondition of the environment protection

The waste economy represents the sum of all political, scientific, technical and other measures achieving the reduction of the waste, the use of the waste and the safe disposal, by keeping the existing production and consumption[5]. Those goals can be reached only in the market oriented economy and with flexible solutions, taking into consideration:

- Ecological benefits,
- Technical feasibility using the best available techniques,
- Economic feasibility.

Regional and sociological differences in a certain town i.e. region affect the amount of the generated waste and its make up where the setting of waste economy is being carried out such as village regions, town regions, agricultural and industrial zones of the area. These reasons, for the setting of the integral waste management system-waste economy, require detailed work on the following data:

- Population: number and structure of the population, the surface of the region, the density of population,
- Settlement: towns, villages, number of flats, number of the individual houses (with the number of the household members),
- Industry: number of the companies, number of the employed, number of the hostels,
- -Surrounding: geological conditions, hydro-geological conditions, topography of the terrain and so on.

#### Cooperation with the public

The goal of cooperation with the public is informing the citizens on systems and installations for collection, processing, use and disposal of waste in towns and regions. Cooperation with public stimulates citizens, producers and vendors on reduction of waste and avoidance of waste production.

#### Avoiding waste

One of the principal goals of the integral waste production system- the waste economy is to avoid waste generating. Direct influence on avoiding waste and production of certain products in trade and industry is limited. That is why avoiding must be done indirectly by stimulating the citizens, producers and vendors with following measures:

- Cooperation with the public: the goal is stimulation of citizens and industrial-trade organizations to avoid waste, for example, they shouldn't use products with little packaging but they should use multiuse products, etc.
- Legal regulations: the legal acts on connecting municipal waste companies in regional level, introduction of the cycle for useful waste components, etc.

#### The use of waste

- a) Material use of the useful waste components—the goal is to use components from waste as useful material. In order to use useful components as material from waste, the market of waste must be established for glass, paper, cardboards, construction waste, plastic mass, woods and organic waste. Material use of the useful waste components is possible to achieve by the building installations for separation, installation for composting, installations for the recycling of the construction material and waste from the street reconstruction, installation for sludge reconstruction.
- b) Thermal exploitation—primary reason for thermal waste processing is separation of harmful substances and reduction of the waste amount for disposal as well as the use of waste with high thermal power. Achieving these goals can be reached only by building installations for waste combustion, pyrolysis, combustion of waste, and so on.

#### 3. RESULTS AND DISCUSSION

#### 3.1. The aims and directions for the environment protection

In order to protect the ecosphere, i.e. all environmental components (water, soil, air, flora and fauna, landscapes and constructed surrounding), the environment protection policy in the Republic of Srpska (BiH) is based on the international conventions from that area:

- Reduction in use, prevention of burdening and polluting environment, prevention of damaging, as well as improving and the remediation of the damaged environment,
- Human health protection and improving conditions for the life quality,
- Safe keeping and protection of natural resources, rational use of resources and the economy manner to ensure the renewal of resources,
- Coordination of other interests and entities with the demands for the environment protection,
- International cooperation in the environment protection,
- Initiatives by the public and participation of the public in the activities aiming for the environment protection,
- Coordination of economy and integrating of the social and economic development according to the requests for the environment protection,
- Setting of and development of the institutions for development and saving the environment.

Achieving the goals to protect the environment from the hazardous waste should be done to prevent the pollution and reduce consequences for the human health and the environment. The following measures can reach those goals [6]:

- Reduction in generating of waste to minimum, by reducing to minimum hazardous characteristics in particular,
- Reducing the amount of the waste taking into consideration special and hazardous waste,
- By processing waste and recovering useful materials from it,
- Combustion and disposal of waste which cannot be recovered, reused or used for the production of the energy in the manner acceptable for the environment.

The processing and disposing of waste should be carried out in the manner that is not endangering human health and without producing the harmful consequences or significant risk for the main components of the environment (Figure 2), in particular [7]:

- Without risk for the water, air, soil, flora and fauna,
- Without making hindrances via noises or unpleasant smells,
- Without harmful influences/ affects on nature or on the location of the special interest.

Carrying out these goals for protection and following all stated demands, is a very complex project. This project needs to be resolved by parallel researches and development of the waste economy (is yet to be formed in the Republic of Srpska (BiH)).

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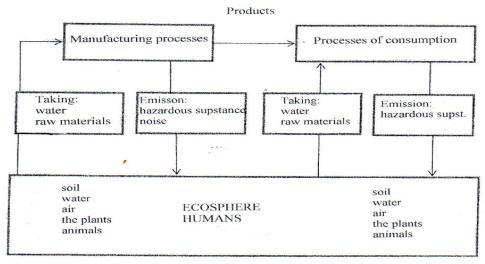


Figure 2.Man's influence on the environment (Source:BMU,2005)

With the idea on forming of a new product all relevant factors that could affect its final form should be taken into consideration (Table 1)[9]. Also, input- output analysis is often used when we choose the optimal choice (Figure 3)[1]which is a detailed image of material and energy flows. The basic for this analysis is the principle by which the materials and energy that enter the process of "transformation" are not lost but only their forms are changed.

Number	Description
1.	Choosing the basic materials with low amount of the harmful components
2.	Minimizing the use of materials
3.	Extending the life time of the product
4.	Possibility of dissembling
5.	Unification of the integral parts
6.	The possibility to re-use the integral parts
7.	Reduction of the integral parts
8.	Unification of the basic parts
9.	The possibility of the material re-cycling
10.	Minimizing of the material
11.	Using the material for packaging which can be recycled or biologically

Table 1. Factors affecting the choice of a new product (Source: Abfallwirtschat-journal, 1995)

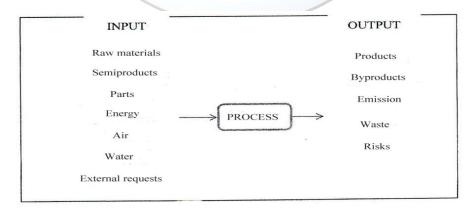


Figure 3. Input-Output Analysis (Source: Đukić, 2008)

decomposed

#### 4. CONCLUSION

Waste production in real life is inevitable. Man produces and creates a lot, entailing some undesirable phenomena such as the production of waste. Waste cannot be completely removed but it can be reduced to an acceptable measure, which can be achieved only if we all become a part of its reduction. We achieve that primarily by education and raising public awareness in whole society.

The general ecological advantages by setting the whole waste management system are: reduction in the amount of waste being disposed at dumps, conditioning the reduction in the dump gas production, dump filtrate and many other harmful substances which are negatively affecting the basic elements of the environment i.e. directly or indirectly on human health, reduction in the total amount of waste would provide conditions for better use of existing waste dumps and a series of all other advantages.

The general economic advantages are: separation of all useful components from the waste (paper, glass, plastic, wood and other) and their use in the technological production processes of the same or the similar products or producing of the energy, saving non renewable raw-materials for the future generations, saving in the use of energy and other components during the production of certain products by using the secondary materials, creating new jobs. Reaching the goals for protecting the environment from hazardous waste needs to be conducted to prevent pollution and reduce the consequences on the human health and the environment.

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# Importance of the Marine Science and Charting about Environmental Planning, Management and Policies at the Turkish Straits

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The Turkey is in a good position which has covered by water and also has the gate that connected the Asian and Europe continents. The Turkish Straits sea area is consist of Strait of the Istanbul (Bosphorus), Strait of the Canakkale (Dardanelle) and also Sea of Marmara. The Straits of Istanbul and Strait of Canakkale are connecting the Black Sea with the Aegean Sea through by Sea of Marmara. The Turkish Straits have a really importance from the history because of the geopolitics, strategic and geographic situations. These importances, especially strategic one is that the only water route between the Mediterranean Sea and the Black Sea, so the Turkish Straits sea area has been the site of significant settlement area and also city of Istanbul for a long time in the past. The Turkish Straits have been governed by the Montreux Convention, since the 1936. From past to recent years this gate is the most important trade way of the world cause of the oil and oil products. These economic, strategic and also trade considerations have high level risk management about maritime transportation at the Turkish Straits. For these circumstances, need to deeply survey at the Turkish Straits about marine science, find all the risk factors at the end need to shown by the charts on the bridge of the ships and coastal facility for use all the mariners. These results could have chance to make environmental planning, management and their policies for maritime transportation, decrease marine pollution and protect all the straits shoreline by the regulations which aimed at the minimising shipping accident, avoiding collisions and protecting marine environment. With this working, try to explain the marine science and their surveys importance for environmental management, planning at the Turkish Straits.

**Key words** 

Chart, Environment, Turkish Straits

#### 1. INTRODUCTION

The Turkey is in a good position which has covered by water and also has the gate that connected the Asian and Europe continents. The Turkish Straits sea area is consist of Strait of the Istanbul (Bosphorus), Strait of the Canakkale (Dardanelle) and also Sea of Marmara. The Straits of Istanbul and Strait of Canakkale are connecting the Black Sea with the Aegean Sea through by Sea of Marmara. The Turkish Straits have a really importance from the history because of the geopolitics, strategic and geographic situations. These importances, espacially strategic one is that the only water route between the Mediterranean Sea and the Black Sea, so the Turkish Straits sea area has been the site of significant settlement area and also city of Istanbul for a long time in the past. All

part of the sovereign sea territory of Turkey and subject to the regime of internal waters. The Turkish Straits have been governed by the Montreux Convention, since the 1936. Turkey, due to its treaty obligations under the Montreux Convention, first gave annual reports to the League of Nations Secretary-General, since 1945, has given these to the United Nations Secretary-General. These reports, which also go to the High Contracting Parties, are entitled, Rapport Annuel sur le Mouvement des Navires a Travers les Detroits Turcs' (Annual Report Concerning the Movement of Ships through the Turkish Straits). Another important point in favour of using the expression the Turkish Straits' comes from a UN document. This is the Third United Nations Conference on the Standardizations of Geographical Names', held at Athens, in 1977, and attended by 152 participants representing 59 countries, with observers from 11 non-governmental and international scientific organisations. The basic aim of the conference was to use national names to standardise the names of geographical locations. The Conference resolutions empower Turkey in the use of the name 'Turkish Straits'.[1] This document's title is evidence of the international credence of the expression 'Turkish Straits'.[2]

From past to recent years this gate is the most important trade way of the world, cause of the oil and oil products. Throughout the history, this situation due to the geographical location, has lead to conflicts between Turkey and the countries both coasting and non coasting the Black Sea in terms of political, economic and strategic interests. Straits seperating Turkey's land into two part as Asian side and European side resulted in the facts that Turkey's territorial integrity and independence are directly related to the legal regime which the straits are subject to. [3] In Montreux Conference, representative of Romania, Nicolae Titulescu's expression "Straits are the hearts of Turkey, but also lungs of Romania" affirms the importance of the Straits.[4]

The Turkish Straits sea area has very special ecological conditions in terms of marine environment which includes atmospheric and oceanographic conditions, plant and animal diversity and also terrestrial environment. Besides strategic, economic and geologic situations, this area also has roles as biological corridor and biological barrier between the Mediterranean Sea and the Black Sea and form an acclimatization zone for migrating species. Due to being the only maritime access for the neighboring the Black Sea states and the Central Asian Turki Republics, the Istanbul Strait has been exposed to dense marine traffic for centuries and substantial increase has occurred in size and tonnage of the ships passing through the Straits with hazardous cargo varieties and amounts they carry. Increase in the number of vessels that navigates on the Straits and being on the transportation way of hazardous and dangerous materials pose serious environmental and safety hazards for the İstanbul Strait, Marmara Sea and the surrounding residential areas. Geographic and oceanographic features of the İstanbul Strait makes the navigation on the Strait rather difficult and consequently the Strait has faced many casualties that caused severe environmental problems due to thousands tons of oil spill occurring in recent decades. [5]



Figure 1. Turkish Straits Sea Area Scheme

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#### 1.1. İstanbul Strait (Bosphorus)

Istanbul Strait is important narrow waterway of the world. It is also linking the Black Sea with the Agean Sea by the Marmara Sea and also separates European and Asian continents. The Istanbul Strait is one of the most important routes of oil transportation, as it connects the Black Sea and the Mediterranean Sea. Also it has most busy and dangerous maritime traffic line like the Malaka Strait. It has really different and special geographical, hydrographical, oceanographical and meteorological conditions. It is not only important narrowest straits of the world but also has sharp turns more than 10 times. 17 nautical miles length of the Istanbul Strait's European coastline is nearly 55 kilometers, Anatolian coastline is 35 kilometers. The Istanbul Strait sea bottom topography reveals many banks, holes, shallows and also sinks. In according to the Maritime Ministry Database, there are 26606 vessel with totally 329.121.399 gross tones, passed through to strait, 14082 of them used pilot help, 15198 of them passed strait as transit vessel, 2390 of them bigger than 200 meters, 678 of them bigger than 500 gross tones, 5327 of them tanker vessel at 2014.



Figure 2. Istanbul Strait Overview

#### 1.2. Canakkale Strait (Dardanelle)

The Strait of Canakkale is about 37 nautical miles long and is generally straightforward, with the exception of two significant turns, near the city of Canakkale, where the strait reaches its narrowest width about 1300 metres. Navigation is less dangerous than in the Strait of Istanbul, although strong currents numerous eddies and counter currents are experienced throughout the strait. A limited number of passenger and car ferries run daily between Canakkale on the Asian side and Eceabat and Kilitbahir on the European side. In according to the Maritime Ministry Database, there are 25.551 vessel with totally 428.721.565 gross tones, passed through to strait, 11114 of them used pilot help, 15240 of them passed strait as transit vessel, 3280 of them bigger than 200 meters, 316 of them bigger than 500 gross tones, 5606 of them tanker vessel at 2014.



Figure 3. Canakkale Strait Overview

#### 1.3. The Marmara Sea

It is very clear that, The Marmara Sea joins the Istanbul Strait to the Canakkale Strait and sea area distance is about 110 nautical miles, and does not pose any significant navigational hazards to vessels. It approaches to the two straits tend to be more congested than the open sea approaches. The approach to the Canakkale Strait has limited anchorage space and that space is close to the traffic lanes. The Marmara Sea is an intracontinental basin 275 km long and 80 km wide formed as a result of pull-apart tectonics along the North Anatolia Fault.[6]

#### 2. IMPORTANCE OF MARINE SCIENCE

The Marine Science has internationally importance about the sea and environmental research of the world. Also it has got many sub-divisions like hydrography, oceanography, meteorology, climatology, marine geology and geophysics etc. This is the first question when someone hear something about the marine sciences, "What is working for?". Surely the answer is following, measure and describe bodies of sea by use all sub-divisions. All these sub-divisions measures gains are as following, depth of sea, seabed profile, current, velocity, salinity, ecosystem, environment dynamics, pollutions etc. Apparently, marine sciences are important parts of the maritime and environment. Some marine science disciplines should be known for all mariners and also environmental specialist.

#### 2.1. Hydrography

Hydrography is the science that measures and describes the physical features of bodies of sea and the land areas adjacent to those bodies of sea. In according to International Hydrographic Organization-IHO definition, Hydrography is the branch of applied sciences which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes and rivers, as well as with the prediction of their change over time, for the primary purpose of safety of navigation and in support of all other marine activities, including economic development, security and defense, scientific research, and environmental protection.[7]

Hydrographers conducts hydrographic surveys to measure the depth and bottom configuration. All hydrographic datas are used to update nautical charts and develop hydrographic models; increasingly, are used for multiple purposes, through the integrated seas and coast by eligible programs. The main data type common to all hydrographic surveys is the depth. Of additional concern to many surveys is the nature of the seafloor material like sand, mud, rock due to implications for anchoring, dredging, structure construction, pipeline and cable routing, and fisheries habitat, pollutions and also environmental solutions.



Figure 4. Hydrographic Surveying by Research Ship

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#### 2.2. Oceanography

Oceanography covers a wide range of topics, including marine life and ecosystems, ocean circulation, plate tectonics and the geology of the sea floor, and the chemical and physical properties of the ocean. Just as there are many specialties within the medical field, there are many disciplines within oceanography. [8]

Biological oceanography and marine biology study plants and animals in the marine environment. Chemical oceanography and marine chemistry study the composition of seawater, it's also processes and cycles, and the chemical interaction of seawater with the atmosphere and sea floor. Geological oceanography and marine geology explore the ocean floor and the processes that form its mountains, canyons, and valleys. Physical oceanography study the physical conditions and physical processes within the ocean such as waves, currents, eddies, gyres and tides; the transport of sand on and off beaches; coastal erosion; and the interactions of the atmosphere and the sea.

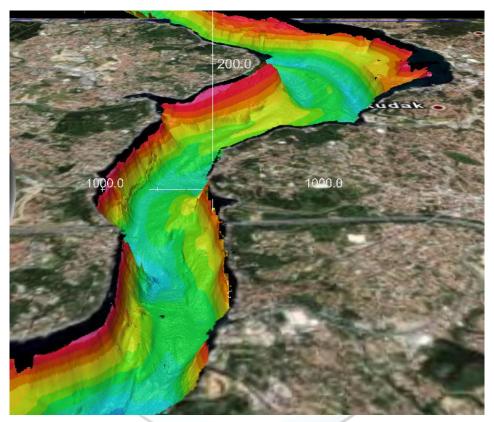


Figure 5. A part of the Istanbul Strait Seabed Profile

#### 2.3. Meteorology

Meteorology, the study of the earth's atmosphere, is a component of earth system science. The temperature, wind, and precipitation that we observe and experience impact, and all are impacted on by, various scales. Weather, which is at one end of the meteorological spectrum, generally refers to short-term fluctuations which includes less than a couple of weeks. While the climate is characterized by longer time scales from months to years. On short time scales - convection, which are more important especially for mariners during to navigation. Also on short time scales - convection, like cloud cover, humidity, soil moisture, can all impact a forecast while climate is impacted by solar variations, volcanic eruptions, and changes in the sea circulation.

#### 2.4. Coastal Management

Coastal Management integrates the biological, physical, and policy sciences to plan and execute sustainable solutions for environmental challenges where land meets water. The well-created coastal management understands both the science of contemporary issues and the political and socioeconomic complexities facing coastal areas. Nearly 2/3 of the global population living within 100 km of coasts, impacts on the water and land in narrowly concentrated corridors are magnified by the potential for sea level rise and other coastal

changes. Coastal Management is particularly applicable to emerging specialties in sustainability, one of the most rapidly growing fields in the 21st century and an inevitable condition for environmental management.

#### 2.5. Environmental Sciences

Environmental science is also defined as the study of the interaction between the biosphere, lithosphere, hydrosphere and atmosphere, and represents a framework for studying problems that fall outside the realm of traditional scientific disciplines. Environmental science is also concerned with the relationship of human activities and the supporting environment. It provides the framework for making rational environmental decisions and solving pollution problems for land and sea.

#### 2.6. Environmental Resource Management

Environmental Resource Management has become an area of national and international significance. Resource managers, typically in the public and private developmental sectors, face increasingly complex technical problems that can cut across several of the more traditional educational disciplines. In addition to the fundamentals of biological and chemical environmental processes, management authorities and also managers must be knowledgeable in local, region, and global cause and effect relationships of human activities in the development and utilization of environmental resources. Resource management authorities and managers must also understand the legal and regulatory aspects of resource and environmental impact assessment. Recognizing these multidisciplinary needs, the master's degree program in Environmental Resource is a option in the Environmental Sciences Program at Florida Tech and includes both university course work and an internship with a regulatory agency or private company involved in environmental resource management. Graduates are well prepared to effectively interact with engineers, scientists, managers, and politicians. [9]

#### 2.7. Other Sciences

Marine biogeochemical research of oceans as transporters and processors of chemical elements that are essential to the functioning of the planet, such as carbon, nitrogen, phosphorus, oxygen, sulfur, silicon and iron. Marine biogeochemical is to determine how these elements, which are mobilized by natural and anthropogenic sources, are distributed and flow among the water masses, the seabed, particulate matter, living organisms, and the food webs of which these organisms form part. Particular attention is paid to the processes that occur across the interfaces between compartments which includes are water-particles, water-organisms, water-sediment, water-atmosphere. The environmental conditions of the past are also studied through the geochemical "footprints" stored in the seabed.

Science for the conservation of natural marine resources aims to provide the basic scientific knowledge necessary for the conservation and sustainable management of the marine environment and its natural resources. Therefore assesses the vulnerability of coastal areas and deep-sea ecosystems to human activities which includes fishing, trawling, pollution and changes in coastal and deep-sea morphology and their modulation by natural factors. It also needs to studies the potential of Marine Protected Areas as essential habitats for breeding and protection of endangered species. The science and research are aimed at improving basic knowledge of the ecology of exploited species and determining the interactions between the components of food webs. In order to assess changes in biodiversity and the exploitation of living resources, research is also aimed at identifying indicators of ecosystem impact and developing and applying models using bio economic and ecosystem approaches. Finally, the development of new biotechnological applications is studied in order to move towards an ecologically sustainable and profitable aquaculture.

Structure and dynamics of marine ecosystems research line is to understand the processes that occur in the marine environment and their variability. This will allow to detect the most significant natural changes and to assess their possible implications in the global change. The research aims to determine the main feedback mechanisms between environmental force which include climate, UV radiation, hydrodynamics, etc. and biological processes (reproduction, life cycles, food chains, benthos-plankton coupling) in order to quantify the productivity, diversity and stability of the ecosystems. [10]

Physics of the ocean and climate aims are to describe and explain the physical behavior of the oceans and its role in the earth's climate, using the principles of fluid mechanics and thermodynamics. Variations in temperature and salinity and in the density patterns in the oceans are observed and analyzed in order to develop models to explain the dynamic interaction between climate forcing and the state of the oceans. Researches of water movement means waves and currents, the transfer of energy and momentum between the ocean and the atmosphere, and the special properties of sea water such as the propagation of electromagnetic energy are used to improve knowledge

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of the physical processes of the ocean. This research also includes technical analyses of oceanic data obtained from space, especially data on surface salinity. At the end, it includes the design of oceanographic instrumentation and the development of advanced numerical models for studying various aspects of ocean dynamics.

Marine geosciences generally research geomorphology, sediment dynamics, geochemical flows, stratigraphy and tectonics of coastal regions, continental margins and ocean basins at all spatial and temporal scales. Marine geosciences also research includes the analysis of present-day sedimentary processes in response to natural and anthropogenic phenomena, the study of the morphology and structure of the seabed, and the assessment of geological hazards in coastal zones, continental margins and basins. In order to improve the general management of the seabed, some applications of this research line address issues such as the vulnerability of coasts, marine pollution, coastal and offshore facilities, oil and gas exploration, geological hazards, climate change and associated changes in sea level.

### 3. IMPORTANCE OF THE MARINE SCIENCE AND CHARTING ABOUT ENVIRONMENTAL PLANING, MANAGEMENT AND POLICIES AT THE TURKISH STRAITS

As mentioned first part of study that, in 2014, there are 26606 vessel with totally 329.121.399 gross tones, passed through to straits, 14082 of them used pilot help, 15198 of them passed strait as transit vessels, 2390 of them bigger than 200 meters, 678 of them bigger than 500 gross tones, 5327 of them tanker vessel at Istanbul and 25.551 vessel with totally 428.721.565 gross tones, passed through to strait, 11114 of them used pilot help, 15240 of them passed strait as transit vessels, 3280 of them bigger than 200 meters, 316 of them bigger than 500 gross tones, 5606 of them tanker vessels at Canakkale. Huge traffic causes many problems. As a result of these problems, some guidelines and national and international regulations have been established for mariners like SOLAS, MARPOL, STCW, SAR etc. International Convention for the Safety of Life at Sea - SOLAS Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships and also all kind of ships. The first version was adopted in 1914, in response to the Titanic disaster, the second in 1929, the third in 1948, and the fourth in 1960. The 1974 version includes the tacit acceptance procedure - which provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties.[11]

The Convention in force today is sometimes referred to as SOLAS, 1974, as amended. International Convention for the Prevention of Pollution from Ships which has acronym MARPOL is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The MARPOL Convention was adopted on 2 November 1973 at IMO. The Protocol of 1978 was adopted in response to a spate of tanker accidents in 1976-1977. As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent convention. The combined instrument entered into force on 2 October 1983. In 1997, a Protocol was adopted to amend the Convention and a new Annex VI was added which entered into force on 19 May 2005. MARPOL has been updated by amendments through the years. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes. MARPOL-Annex I is really important for Turkish Straits cause of its content. Annex I, Regulations for the Prevention of Pollution by Oil which entered into force 2 October 1983, covers prevention of pollution by oil from operational measures as well as from accidental discharges; the 1992 amendments to Annex I made it mandatory for new oil tankers to have double hulls and brought in a phase-in schedule for existing tankers to fit double hulls, which was subsequently revised in 2001 and 2003. [11]

MARPOL -Annex IV Prevention of Pollution by Sewage from Ships which entered into force 27 September 2003, Contains requirements to control pollution of the sea by sewage; the discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nautical miles from the nearest land; sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 nautical miles from the nearest land. MARPOL-Annex VI Prevention of Air Pollution from Ships which entered into force 19 May 2005, sets limits on sulphur oxide and nitrogen oxide emissions from ship

exhausts and prohibits deliberate emissions of ozone depleting substances; designated emission control areas set more stringent standards for SOx, NOx and particulate matter. A chapter adopted in 2011 covers mandatory technical and operational energy efficiency measures aimed at reducing greenhouse gas emissions from ships. Also green port projects draws attention to the great importance is given in the last days. Governments and legislators around the world view ports and terminal as critical infrastructure assets. Their ability to 'go green' by reducing their carbon footprint, and by being more sensitive to environmental considerations, is vital to future success. GreenPort provides business information on environmental best practice and corporate responsibility centred around marine ports and terminals, including shipping, transport and logistics. [12]

In according to Ministry of Environmental and Urbanisation's policies of Marine and Coastal Area Management show that, there are some procedure and principles concerning the ship-sourced waste notifications. The waste notifications that are required to be made by ships over Ship Waste Tracking System (SWTS-GATS) shall be made by the owner, operator or authorized agent of the ship to the relevant waste reception obligator and port authority at least 24 hours prior to the arrival of the ship at the port or upon departure from the previous port if the duration of the voyage is less than 24 hours. Any changes that might take place related to the time of arrival at the port or the quantities of waste after the waste notification is made shall again be immediately notified over GATS. The ship master, owner, operator or authorized agent of the ship shall be obliged to submit the Waste Notification Form contained in Annex-1 of the 2013/12 Circular on the Implementation of Ship Waste Tracking Systems to the relevant waste reception obligator and Port Authority through fax in case of force majeure events, where they cannot access GATS. Services to be rendered by the waste reception facilities and waste reception ships are performed in return for a fee. The list of fees to be charged to ships are determined by the Ministry of Environment and Urbanization and published in Official Gazette dated 05 June 2009 No: 27249 (Notification Regarding the Fees and Principles to be Implemented Within the Scope of the Regulation on Taking Waste from the Ships and Waste Control). The coastal facility evaluation of the risk and emergency response plan is prepared by Institutions which are authorized by responsible ministry. These institutions are learned from Environment Impact Assessment which is one of responsible ministry's departments. [13]

Oil and chemical spillages in accidents that occurred, studies is executed and interfered within the scope of Law no: 5312 "Law Pertaining to Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances" and Regulation of application of this Law. [13]

If the legal response with chemical-dispersants to oil pollution which is caused by ship wrecked that related with this legislation, in this case, the Ministry's authorization has to be taken to use dispersants. And the use of dispersants without permission from the Ministry is illegal. And environmental law for operation is done to users. [13] The scope of the law No. 5312, Coastal facilities shall be obliged to take financial liability insurance against the damages under this Law. Coastal facilities that fail to comply with the requirement to take insurance shall not be allowed to operate. Coast Facilities Sea Pollution Compulsory Liability Insurance; This insurance provides coverage for legal liability in accordance with the Law No. 5312 dd. 3.3.2005 on the Principles of Responding in Emergencies to Marine Pollution Caused by Petrol and Other Harmful Substances, and Compensation of Damages and Losses, expenses for purification of sea, transportation and removal of collected garbage, claims as a result of death or bodily damage of third parties and loss or damage of private goods arising from pollution or pollution risk in inland waters, coastal waters, continental shelf, exclusive economic zone of Turkey, caused by the coast facility indicated on the policy in respect of General and Special conditions. In this context, to meet the damages, at the initiative of the Ministry, Coast Facilities Sea Pollution Compulsory Liability insurance and Environmental Liability Insurance's general conditions are prepared by Undersecretariat of Treasury. And ships have to have P&I Club Insurance. [13]

Below mentioned authorities have the authority to supervise adherence to Environment Law No. 2872 in marine areas under the jurisdiction of the Republic of Turkey and the authority for decision making in the enforcement of administrative sanctions in accordance with Article 24 of the same law: Ministry of Transport, Maritime Affairs and Communications, Coast Guard Command, Boat Commands affiliated with Regional Commands, Istanbul Metropolitan Municipality, Kocaeli Metropolitan Municipality, Antalya Metropolitan Municipality, Mersin Metropolitan Municipality. [13]

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Date Vessel Name and Flag Accident Area Accident Type and Oil Spilt World Harmony (Greek) v. Peter Collison and fire: 18.000 tons oil 14.12.1960 Kanlica Zoranic (Yugoslavia) spilled Norborn (Norvegian) v. wreck of 15.09.1964 Contact: fire and oil spilled Kanlica Peter Zoranic Lutsk (Russia) v. Kransky Oktiabr (Russia) Collison and fire: 1,850 tons oil 01.03.1966 Kizkulesi spilled Collison and fire: 20.000 tons of Independentia (Romania) v. Evriali oil spilled and 50,000 tons of oil 15.11.1979 (Græk) burned Nordic Faith (British) v. Stavanda 09.11.1980 Collison and fire (Græk) Bluestar (Malta) v. Gaziantep 29.10.1988 Ahirkapi Contact: 1.000 tons ammonia spill (Turkish) Jambur (Iraqi) v. Da Tung Shan Collision: 2,600 tons oil spilled 25.03.1990 Sariyer Collison and stranding: 22 tons oi 13.03.1994 Nassia (Philippines) v. Shipbroker Bebek spilled 1982 Unirea 66.400 tons oil spilled 07.12.1999 Semele v. Sipka Yenikapi Collision: 10 tons oil spilled 29.12.1999 Volganef 248 Florya 1.500 tons oil spilled 06.10.2002 M.V. Gotia Emirgan Dock Stranding: 20 tons oil spilled 10.12.2003 Grounding: 230 tons oil spilled Svyatoy Panteleymon (Georgia) Anadolu Feneri

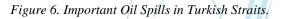




Figure 7. 1994 M/T Nassia and M/V Ship Broker's Collision

#### 4. CONCLUSION

The Turkey is on a good position that surrounded by seas on three sides. Also has the Turkish Straits that connects the Black Sea to the Mediterranean Sea by Turkish Straits sea area which includes Istanbul Strait, Canakkale Strait and the Marmara Sea. Turkish Straits which have an important position in the geographical structure of the natural obstacles to safe navigation and structure is filled with many parameters due to factors because of its strategic importance and geographical political, economic, military, including many areas, The relevant parameters of obstacles to safe navigation and result a negative effect on environmental management undoubtedly the effect of marine Sciences and marine mapping products is very important. The Benefits of marine science to mariners and environment management have enormous impact in ensuring the safety of all marine habitat. Due to the energy source research especially in the Caspian Sea and the Mediterranean sea, therefore the importance of the use of the Turkish Straits waterways have increased.

In the light of the aforementioned remarks that, the Turkey has great importance about national and international maritime transportation. Marine Science can able to measure all the sea whichs are belong to Turkish territorial sea and the Turkish Straits. Marine science and environmental science are using the formation of hydrography, oceanography, cartography and meteorology, such as more emphasis to the data that are important to the safety of navigation and support to environment management further mapping and marine show needs to be taken. Ultimately, the question of, "What is importance of Marine Science?", cannot be fully answered without considering all sub-divisions, the language of all marine and environmental science.

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## Proposals for the Protection of Water Resources in the Prespa Lake Basin, Greece

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Publication Info Abstract

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The present paper focuses on the region of Prespa in northwestern Greece, a disadvantaged mountainous region, whose natural environment is protected by numerous international treaties (Ramsar, Natura 2000) and which depends heavily on its surface water resources for most of its socio-economical activities. The study area's primary surface water bodies are the trans-border lakes Small and Great Prespa, which, over the years, have witnessed a decline in both the quality and the quantity of their waters. Therefore, the paper's main objectives are to investigate the pressures that the water resources are under and to propose ways to counteract the current negative quantity and quality trends. The research methods employed in the present research include: review of relevant literature and the implementation of a set of methodological tools, namely SWOT Analysis, Stakeholder Analysis and the Logical Framework Approach (LFA). The literature review showed that activities of the primary sector are responsible for the largest percentage of water use in the study area, agriculture being the top consumer of water. Therefore, the paper discusses new irrigation-related technologies, aimed at achieving higher water efficiency and lower levels of agrochemical pollution of the aquifer. The implementation of the methodological tools results in an overall schematization of the factors that can affect water resources in the study area and in probable policy making axes. The research concludes, among others, that the region can exploit several developmental and financial programs in order to achieve the goals of enhancing water quality and quantity and achieving sustainable economic development.

**Key words** 

Irrigation, Prespa lakes, Water resources

#### 1. INTRODUCTION

The protection of the environment and the establishment of a global framework of sustainable development has been a permanent topic in the sector of policy making in recent decades. Indeed, both the continuation of life in general, and the vast majority of modern human activities heavily depend on the condition and availability of natural resources.

Water is one of those natural resources because of its importance both for the continuation of life and for many activities of economic nature, i.e. industry, agriculture, tourism etc.. The importance of water resources is further highlighted in small remote regions where agriculture is usually the main economic activity and the primary source of income.

The Greek part of the Prespa region, which is the focal point of the present paper, belongs to the type of regions described above. It is located in northwestern Greece, on the borders between Greece, Albania and the Former Yugoslav Republic of Macedonia (F.Y.R.O.M.) and gets its name from the two trans-border lakes that are found in it, namely Lakes Small and Great Prespa. Great Prespa Lake is divided between the F.Y.R.O.M., Albania and Greece, whereas lake Small Prespa is divided between Greece and Albania.

It is calculated that 65% of the active population is occupied in the primary sector, the main economic activities in order of population occupied in them - being: agriculture, stock raising, fishing and forestry. An interesting fact is that about 58% of the crops in the study area are bean cultivations, so that beans can be characterized as a monoculture for the study region [9]. During the last years, activities of the tertiary sector, such as tourism and commerce have also witnessed a development, accounting for the occupation of 23% of the population [10].

The study area also has a unique environmental and ecological value mainly due to its rich biodiversity centered around the Prespa Lakes. Specifically, in the region one can find circa 1500 plant species, 60 mammal species, 33 species of reptiles and amphibians, 23 species of fish – of which 9 are endemic – and 273 bird species, among which the most populous colony of the globally rare Dalmatian pelican in the world [14]. It is calculated that the region of Prespa gathers over 50% of the bird, amphibian and mammal species that can be found overall in Greece [4].

The study area's aforementioned ecological value is reflected on the legal protection regime that exists in the area. As far as national legislation is concerned, the Prespa National Forest was declared in the Greek part of Prespa in 1974 and was extended and renamed to Prespa National Park in 2009, covering 32,700 hectares. As for international legislation, two areas within the Prespa basin, Lake Small Prespa or Micro Prespa and Mount Varnous, have been designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under Directives 92/43/EC ("Habitats/NATURA Directive") and 79/409/EEC ("Wild Birds Directive") respectively. According to these designations they have been included within the NATURA 2000 network sites, under the codes GR1340001 (Lake Small Prespa) and GR1340003 (Mount Varnous) [6].

Lake Micro Prespa is also one of the 10 sites in Greece designated under the Ramsar Convention on Wetlands, an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources, as a contribution towards achieving sustainable development throughout the world [6].

For all the reasons described above, it is obvious that the natural environment of the region of Prespa is considered highly valuable. Furthermore, it is obvious that the area's water resources are important both for environmental and for economic and developmental reasons. Therefore, the present paper focuses on investigating the pressures that the study area's water resources are under, on assessing whether corrective plans should be implemented and if so, what those corrective plans should be.

#### 2. MATERIALS AND METHODS

The methods and techniques used in the present research are: the review of the relevant literature and the implementation of methodological tools.

The review of the relevant literature is a standard method used to record the current knowledge and theoretical and methodological contributions on a certain topic. As such, it is not described further in the present paper, as its characteristics can be accessed fairly easily on various sources.

The methodological tools employed in the research are described below.

#### 2.1. SWOT Analysis

SWOT Analysis is a standard tool used in various types of cases and consists in the recording of the Strenghts and Weaknesses of an idea or project, in other words, its internal environment, as well as the Opportunities and Threats that can affect its course or development, which, in turn, constitute its external environment. The initial letters of the words Strengths, Weaknesses, Opportunities and Threats make up the name of the method.

After the recording of the various characteristics of the issue under question as described above, Strengths can be combined with Opportunities in order to neutralize Weaknesses and prevent the manifestation of Threats.

In the present paper, the SWOT Analysis was implemented on the study area aiming to form proposals for the protection of water resources.

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#### 2.2. The Stakeholder Analysis

The Stakeholder analysis consists in the identification of the implicated parts in a project, proposal or situation, of their interests and their needs in relation with the project under question, as well as the implications-pressures that they cause or that can be caused to them by the implementation of the aforementioned project, proposal or situation [3].

In issues regarding water resources management, the Stakeholder analysis has to include all users of the water resources of the region under question who exercise pressure on said water resources and who would be affected by potential proposals for the improvement in the management of the water potential.

#### 2.3. The Logical Framework Approach

The Logical Framework Approach (LFA) is a method developed by USAID at the end of the 60s and at 1990 by a Norwegian working group supported by Samset & Stokkeland. It is promoted by the OECD and the Directorate General for Development of the Committee of the European Communities [12].

It is a detailed tool, which consists of a series of phases and analyses, designed to cover the stages of planning, implementation and management of projects, management plans and other actions.

Its main component is the Logical Framework Matrix or Logframe Matrix, which summarizes the key elements of a project plan as well as how the main goals of the plan will be achieved. In the present research, it is implemented in order to analyze the strategy axes that are proposed for the improvement of the water resources management as well as for the achievement of sustainable economic development in the study area.

#### 3. RESULTS AND DISCUSSION

#### 3.1. Literature Review on the Pressures on Water Resources

#### 3.1.1. Definition and distinction of pressures

In the framework of the present research, pressures on the water resources of the study region were identified following the definitions and categorization of pressures on the aquatic environment, as defined in the European Union Water Framework Directive, or Directive 2000/60/EC.

According to the latter, pressures on water resources are distinguished, on the basis of the spatial dimension of the activity that causes them, in point pressures and non-point (diffuse) pressures, each one related to various pollution sources [2].

Furthermore, pressures on water resources are distinguished between surface water bodies and groundwater bodies, on the basis of the recipient of the pressure and between pollution pressures, quantitative pressures (abstractions) and other pressures, on the basis of the type of the pressure [9].

#### 3.1.2. Pollution Pressures

- 1) Point pressure sources:
  - Urban waste

The collection of urban waste in all Regional Districts of the Municipality of Prespa is carried out through a sewage network, except for the community of Psarades, where the waste management is done in individual systems, which are examined later on in the part that concerns non-point pressures [9].

In the basin of the Prespa lakes, there are no settlements with more than 2000 inhabitants and therefore, the construction of an Urban Waste Treatment Plant is not required, according to Directive 91/271/EEC. However, in the study area there are two Urban Waste Treatment Plants, which use the method of Constructed Wetlands but are currently under reparation works [9].

#### • Overflows from rainwater pipes

Due to the lack of sufficient data for the assessment of the overflows from rainwater pipes as a point pressure, according to the provisions of Guidance document No21: Guidance for Reporting under the Water Framework Directive, they are elaborated together with diffuse runoff from urban areas later on.

#### Industry

There is no remarkable industrial unit operating in the study area.

#### Stabled livestock

Stock raising is an important traditional economic activity in the study region. However, only the breeding of swine can be included in the category of activities that cause point pressure because swine raising units, due to the nature of these animals, require special constructions in a designated space, excluding the possibility of free farming [9].

#### Fishfarming

No fisheries are found in the study area.

#### Landfill sites

Solid waste in the Municipality of Prespa and the regional district of Kristallopigi is gathered and transferred to the Waste Transshipment Stations of the neighboring cities of Florina Kastoria and from there they are transshipped to the regional landfill of Kozani. In any case, there is no pressure caused by landfill sites in the study area [9].

#### • Extractive activity

The operation of quarries or other extractive activities is not permitted within the Prespa National Park, hence there is no pressure caused by extractive activities [9].

#### 2) Non-point pressure sources

#### • Urban runoff and overflows from rainwater pipes

Rainwater is the runoff that goes through built areas and often carries a large variety of pollutants, in quantities that can negatively influence the environment, the surface water recipients but also the underground aquifers. Due to the lack of data on the management of the overflows of rainwater in the settlements of the study area, the assessment of the pressure under question is considered related primarily to the surface area and the use of its built areas [9].

According to the relevant literature, a percentage of urban coverage lower than 3% advocates for an urban runoff and rainwater pipe overflow pressure of low intensity. Urban areas in the study region cover an area of 1.66 km<sup>2</sup>, which correspond to about 0.5% of the total surface area of the study region. In conclusion, it can be estimated that the pressure on the surface water bodies of the study area which is caused by urban runoff and overflows from rainwater pipes is of low intensity [9].

#### Transportation networks

The road network within the study area is mostly provincial, forestal or rural and the regional network has small length and a low daily traffic load. Therefore, runoff from the road network is not a significant pressure on the quality of the surface water resources [9].

#### • Urban liquid waste not treated by a Waste Treatment Plant

The disposal of waste in individual sewage systems is considered a non point pollution. In the study area, this practice is in use only in the Regional district of Psarades of the Municipality of Prespa, which has a population of 83 inhabitants [9]. The estimation of the pollutant loads that end up in Lake Great Prespa are shown on table 3.

#### • Outflows from agricultural activity

Pollutant loads which come from agricultural activities include nitrogen loads, phosphorus loads and pesticide residues. A percentage of the outflowing loads corresponds to the runoff, which burdens the surface waters and a part of them leaches towards deeper ground layers and may burden the waters of the aquifer. The measure of the pollutant load that ends up in the aquatic system depends on its type, on its quantity, on the way and the time of application, on the position and the morphology of the land parcel, on the presence and density of a drainage system and on a large number of ground-related factors [9].

#### • Livestock raising

The sector of livestock raising, except for swine breeding, is included in the activities causing non point pollution on the basis of several criteria concerning the nature of this activity. The basic pollutants produced by livestock are: organic load, nitrogen and phosphorus. According to the relevant literature, the percentage of the produced load that is a runoff to the aquatic systems is 15% for nitrogen and 3% for phosphorus. Furthermore, deep leaching is considered to account for 17% of the nitrogen runoff and for 1% of the phosphorus runoff [9].

#### • Spaces of uncontrolled waste disposal

Uncontrolled waste disposal is a practice which has been abandoned in the study region, hence there is no pollutant load produced by sites of uncontrolled waste disposal [9].

#### • Outflow from other land uses

According to Guidance Document 3 for the Directive 2000/60/EU, "Analysis of pressures and impacts", the primary land uses that are calculated as pressures are urban, forest, herbaceous and bushy areas and agricultural uses. The pressures caused by these uses can be quantified in Total Nitrogen (TN) and Total Phosphorus (TP) [9].

#### 3.1.3. Quantitative Pressures (Abstractions)

Quantitative pressures in the study area's water resources are reported herein according to the main use which they stem from.

#### 1) Abstractions for irrigation

According to the relevant literature, the total abstractions for irrigation are estimated at around 5.9 hm<sup>3</sup> /year, of which 5.02 hm<sup>3</sup> /year are abstracted from surface waters – most of them from Lake Small Prespa- and 0.32 hm<sup>3</sup> /year are abstracted from ground waters [9].

#### 2) Abstractions for water supply

According to the same source, abstractions for the area's water supply are estimated at around 0.37 hm<sup>3</sup>/year, of which 0.24 hm<sup>3</sup>/year are abstracted from surface waters and 0.13 hm<sup>3</sup>/year from ground waters [9].

#### 3) Abstractions for livestock breeding

On the same logic, abstractions for livestock are estimated at around 0.2 hm<sup>3</sup> /year and are abstracted from ground waters [9].

From the data presented above, it becomes obvious that irrigation is the largest consumer of water in the study area and also that the largest quantity of water is abstracted from surface waters, and from the Lake Small Prespa specifically.

#### 3.1.4. Other pressures

The types of "other pressures" defined by the Directive 2000/60/EC are:

- flow regulations hydromorphological alterations
- artificial recharge of aquifers
- desalination
- · sand extractions

For the study region, the relevant literature records that none of the types of pressures mentioned above have an impact on the water resources of the study area [9].

#### 3.1.5. Status of water resources

According to the literature, Directive 2000/60/EC characterizes the ecological and chemical status of surface water resources and quantitative and qualitative status of ground water resources.

For the study area, all groundwater systems are given a Good quantitative and qualitative status [9].

The area's fluvial water bodies are characterized by a "Good" chemical status, whereas their ecological status is unknown [9].

As for the lacustrine water bodies, Lake Great Prespa's ecological condition is characterized as "Moderate" and Lake Small Prespa's as "Poor". However, the most remarkable fact is that the chemical status of both Lakes is characterized as "Bad" [9].

#### 3.2. Implementation of methodological tools

#### 3.2.1. The SWOT Analysis

In order to form proposals for the protection of the water resources in the study area, a SWOT analysis was performed with the aim to record the strengths, weaknesses, opportunities and threats that are present in the region of Prespa. They are recorded as follows:

- 1) Strengths
- Existence of rare biodiversity, protected by the Ramsar Convention
- Area with a remarkable natural environment, included in the Natura 2000 network
- Existence of a large number of studies for the area, that have been executed in the framework of developmental programs and programs of trans-border cooperation (Interreg, Life 2014-2020, Horizon, OEMN etc.)
  - Presence of environmental organizations in the area
- Existence of the monoculture of beans, characterised as product of Protected Geographical Indication (PGI)
  - Existence of organic farming, mainly of Prespa beans
  - Progress of the study for the installation of a drip-irrigation network in the study area
  - 2) Weaknesses
  - Old existing irrigation network, causing remarkable water losses and low irrigation water efficiency
  - Drawdown of Great Prespa Lake, primarily from the 80s onward
- Lack of a common Management Plan for the Prespa Basin in transnational level between the countries which share the Prespa Lakes
  - 3) Opportunities
- Application of Directive 2000/60/EU via the publication of the Management Plan for the river basins of the River basin District of Western Macedonia and that of the Special Management Plan of the basin of Prespa.
- New Common Agricultural Policy for the period 2014-2020, including financial aids like: coupled payments for Natura 2000 areas, for bean cultivation, for disadvantaged/mountainous regions, for organic farming etc.
  - New national Rural Development plan for the period 2014-2020
  - Increase in eco-tourism and agro-tourism
  - Possibility of certification of agricultural products
  - 4) Threats
- Non-global confrontation of problems in a trans-boundary river basin level because of the lack of a common Management Plan
  - Quantitative and qualitative degradation of the water resources caused by human activities
  - Difficult economic period
  - Intense weather phenomena climatic change
- Possible proposals for the protection of water resources can arise from the combination of points from the above recorded SWOT analysis, so that strengths can attract opportunities to prevent the manifestation of threats.

As it was mentioned beforehand, specifically in section 2.1, the points of the SWOT analysis that can be combined on the basis of the previous reasoning can be summarized as following:

For starters, the rich faunal and floral biodiversity of the study area – which is under numerous protection regimes – and the intense presence of a virgin natural environment are elements that can create opportunities for the growth of tourism, especially environmental tourism, agro-tourism etc.

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Secondly, the presence of the bean monoculture creates opportunities for the certification of this product and the creation of a stronger "brand-name" for the area.

Also, organic farming can spread further with the financial aids for organic farming provided by the new Common Agricultural Policy.

In addition, the perspective of the installation of a new drip-irrigation network for the crops of the study area is an opportunity to solve the problems caused by the existing irrigation network and to avoid the threat of the qualitative and quantitative degradation of the water resources.

Finally, the lack of a common trans-border-level Management Plan for the basin of Prespes is a weakness of the study area, which can allow for the manifestation of the threat of a non global confrontation of environmental problems. However, there is a variety of developmental trans-border programs that have taken place and are in progress, which can help prevent the threat under question.

#### 3.2.2. The Stakeholder Analysis

The second methodological tool that was used in the process of forming proposals for the protection of the water resources in the study region is the Stakeholder analysis. A brief description of this analysis can be found on subsection 2.2. of the present paper. The Stakeholder Analysis as it was implemented for the issue under question is presented on table 1, further down.

#### 3.2.3. The Logical Framework Approach

The last methodological tool that was used in the process of forming proposals for the protection of the water resources in the study region is the Logical Framework Approach. A brief description of this method can be found on sub-section 2.3. of the present paper.

The Logframe matrix for the issue at hand is shown in table 2.

Table 1. Stakehol	der Analysis for th	ne region of the l	Prespa Lake basin

Stakeholder	Interests	Needs	Implications/Pressures	Implications/Pressures
			they can cause	they may suffer
			·	, , ,
Farmers	The water resources' good quality is important for the good quality of the crops produced	Water of certain quantity and good quality - Efficient irrigation network	Degradation of water resources' quality due to agrochemicals	Loss of income due to water losses from irrigation network
Livestock breeders	The water resources' good quality is important for the health of the stock	Water of certain quantity and good quality	Degradation of water resources' quality due to livestock waste	Negative implications on health of their stock due to pollution of water resources
Fishers	The water resources' good quality and quantity are important for	Good quality and, if possible, ceasing of the drawdown in	Imbalance in the lakes' ecosystems due to overfishing	Reduction of fish population due to pollution and drawdown of lake waters

	the reproduction and health of the fish	lake waters		
Residents	The water resources' quality affects their health via drinking water – The less polluted the water is, the lower the treatment	Potable water of good quality	Degradation of the lakes' waters due to littering – Over consumption of potable water	Negative effect on their health due to pollution of the aquifer
	costs will be			
Tourists	The better the state that the Lakes' environment is in, the	Potable water of good quality Good state of the	Degradation of the lakes' waters due to littering - Wasting of potable water	Negative effect on their health due to pollution of the aquifer – Negative impression by the state of the
Stakeholder	Interests	Needs	Implications/Pressures	Implications/Pressures
	50		they can cause	they may suffer
	more they feel satisfied with their destination choice - The water resources' quality affects their health via	natural environment		destination they chose
	drinking water			

Table 2. Logical Framework Matrix for the study area

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Overall Goal: The protection of water resources in the study area and the achievement of sustainable development

Description	Indexes	Means of Verification	Assumptions and
			risks
Improvement of qualitative state of the water resources	Pollution Indexes - Characterization of qualitative status of aquatic systems	Measurements – Monitoring of physicochemical parameters and of special pollutants in the river basin	Active commitment of the three neighbouring countries in the control and monitoring of the quality of waters – Implementation of national and community legislation – Implementation of Directive 2000/60/EU – Implementation of river basin management plan – Low increase of
	1		population
Description	Indexes	Means of Verification	Assumptions and risks
1.1 Actions for the concentration of hazardous pollutants in the water bodies	Concentrations of hazardous pollutants and physicochemical variables, according to directives – Characterization of the water bodies' ecological and chemical situation	Field measurements	Approval of necessary funds – Implementation of the appropriate regulations
1.2 Establishment – reinforcement of monitoring mechanisms	Staffing of municipal, regional and national authorities	Reports by said authorities – Posting of work position notices	Approval of necessary funds – Active commitment by authorities
2. Quantitative improvement of water resources	Water Exploitation Index (WEI) – Basin water balance – Levels of the basins water bodies	Measurement of abstractions per use of water – Measurement of rainfall/precipitation	Implementation of Directive 2000/60/EU - Implementation of river basin management plan - Active commitment of the three neighbouring countries in the control and monitoring of the quantity of waters - Low increase of population — Installation of drip irrigation network in the Greek part of the

2.1 Promotion of the installation of irrigation systems	Implementation studies – Inclusion of actions in financial programs	On the spot research/autopsy – Implementation studies	basin Approval of necessary funds
2.2. Pricing actions	Review – Modification of legislation	Publication of law review	Prioritization of the present issue by appropriate authorities
3. Achievement of conditions of economic development	Inhabitants' income pro capita – Increase of population – Increase in work positions	Population census – Regional reports on economy and occupation	Confrontation of difficult economic situation – Diffusion of agricultural products within the basin area – Turn towards alternative tourism – Touristic growth
Description	Indexes	Means of Verification	Assumptions and
/			
			risks
3.1 Actions for the reinforcement of agriculture	Quantities of produce - Producers' income	Records by agricultural cooperatives - Regional reports on agricultural production	Prioritization of the present issue by appropriate authorities - Confrontation of difficult economic situation – Use of the
reinforcement of	Quantities of produce  - Producers' income  Quantities of purchased/sold products - Income	agricultural cooperatives - Regional reports on	Prioritization of the present issue by appropriate authorities - Confrontation of difficult economic

#### 3.3. Discussion

As it has been pointed out beforehand, irrigation is the primary consumer of water in the study area. Furthermore, as demonstrated by the results of the implementation of the LFA in the area, the installation of irrigation-related systems is one of the actions proposed towards achieving the goal of the quantitative improvement of the water resources. Therefore, the present research proposes a set of irrigation-related systems that can assist in the achievement of the aforementioned goal.

#### 1) Installation of a drip irrigation network

The advantages of drip irrigation are widely known. For the study area, the function of a drip irrigation system is expected to lead to the irrigation of a more extended area with the same amount of water. Furthermore, it is

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expected to lead to a considerable reduction in the washout of the terrains and a consequent need to use less fertilizer. This, in combination with the more effective application of water in the root region of the plants will result in less diffuse development of parasitic weeds and consequently, to the use of inferior quantities of herbicides. The lower cost that the producers will have to incur and the expected higher productivity are expected to lead to a better living standard. Finally, the lower expected use of fertilizers and herbicides is expected to lead in the reduction of the concentration of hazardous substances in the aquifer, as these substances end up in the aquifer or the lakes either through the ground or via surface runoff.

#### 2) Reuse of treated wastewater in irrigation

The use of treated wastewater for irrigation is a popular practice in many countries, especially arid and semiarid ones [13]. Many studies have tested its effects on fruit yield and quality [8], [7], [14] and it has also been tested in combination with drip-irrigation systems and Waste Treatments Plants using the method of Constructed Wastelands, a method which is being used in the Waste Treatment Plants of the study area [1].

#### 3) Automated Water-intake Device for Irrigation

The following system focuses on the economical use of water resources. With the aid of an electronic card, a farmer can purchase water quantity units. Subsequently, he/she has the ability to pump the quantity of water he wishes to apply to his parcel. After the quantity has been applied, the pump is automatically switched off, thus avoiding potential waste of water and higher water costs for the farmer. After the end of the irrigation session, the appropriate amount of water quantity units is subtracted from the quantity that the farmer has paid for beforehand.

#### 4) Precision agriculture

Precision agriculture is a new agricultural practice, which utilizes specific information, defined in space and time, to assess the right amount of water or fertilizer needed in a specific area of the crop's surface [5]. In that way, it takes potential variabilities within the same parcel into account.

Precision agriculture utilizes technologies, such as productivity maps, GPS systems, laboratory analyses, GIS and systems of variated application (of fertilizer or water), in order to accurately apply the correct quantities of substances to a particular area of the parcel, depending on the needs of the area under question.

#### 4. CONCLUSIONS

In conclusion, the present paper focuses on the region of the Prespa basin, in northwestern Greece, a tri-state trans-border region with valuable ecosystems and virgin natural environment, which is protected by national and international environmental treaties and legislation. Lakes Small and Great Prespa are the center of this region and take part in most of its socio-economic activities.

According to the literature review that was conducted during the present research, it was found that the quality and quantity of the water resources of the study region have both witnessed a decline. Therefore, the paper analyzed the various kinds of pressure that the water resources are under and subsequently applied a set of methodological tools in order to schematize the study area's environment and to discover ways that the current negative quality and quantity trends can be reversed.

The SWOT Analysis recorded the basic characteristics of the study area and combined them with one another in order to discover ways to create opportunities for economic development and protection of the water resources. The Stakeholder Analysis recorded all the users of water resources in the area along with their interests and needs from using water and the pressures-impacts they can cause or that can be caused to them. Finally, the Logical Framework Approach set the improvement of the qualitative and quantitative state of the water resources in the study area as the main strategy axes and subsequently described actions through which they can be achieved. It can be concluded that with the use of financial aid provided by the new Common Agricultural Policy as well as by programs of developmental nature (Horizon 2020, Interreg etc.), the study region can implement the actions proposed by the present paper towards the goal of protecting the water resources, like the installation of new irrigation-related systems.

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# Trends in Sustainability Reporting Between 2004-2014 by Fortune 250: Turkey Case

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This paper evaluates the trend in sustainability reporting between 2004 and 2014 of Fortune 250 of Turkey. In order to do this, the websites of each company listed in Fortune 250 were analyzed, and the existence of sustainability report, the companies' existing webpage including their ideas and vision related to sustainability were also taken into account separately. This study was repeated for the list of Fortune 250 bi yearly from 2004 until 2014. The analysis of Fortune 250 companies of Turkey between 2004-2014 has shown that, compared with 2004, reporting on environmental and social issues has increased significantly.

**Key words** 

Sustainability, Trend, Turkey, Fortune 250

# 1. INTRODUCTION

Sustainability reporting, has gained large acceptance between the companies over the last twenty years. First environmental reports were published in the late 1980s by companies in the chemical industry which had serious image problems. The other group of early reporters was a group of committed small and medium-sized businesses with very advanced environmental management systems [1]. Many companies now produce an annual sustainability report and there are a wide array of ratings and standards around [2].

A focus on sustainability helps organizations manage their social and environmental impacts and improve operating efficiency and natural resource stewardship, and it remains a vital component of shareholder, employee, and stakeholder relations. Corporate sustainability reporting represents a rapidly-growing arena for corporate reporting that involves reporting nonfinancial and financial information to a broader set of stakeholders than only the shareholders. The reports inform various stakeholder groups on the reporting organization's ability to manage key risks related to the organization that are of a concern to the stakeholders. Because these interests vary, the type of information varies in turn, however, much of the information surrounds economic, operational, social, philanthropic, and environmental objectives [3].

In the millennium age, companies are getting more concerned about sustainability reporting in order to overcome social and environmental drawbacks caused by globalization. Sustainability reports are used as a way of communication tool of companies between them and their stakeholders. As Kolk [4], mentioned that since the publication of the first separate environmental reports in 1989, the number of companies that have started to publish information on their environmental, social or sustainability policies and/or impacts has increased substantially.

With the rise in influence of the global reporting initiative and its series of sustainability reporting guidelines, corporate sustainability reports, also frequently referred to as corporate social responsibility reports and health safety and environment reports, have begun to appear regularly on the websites of many of the world's largest firms, duplicating or more often supplanting printed copies, to the point that even when a printed copy exists it is also available electronically [5]. According to environmentalleader.com, over two-thirds of the Fortune Global 250 issue sustainability reports. Firms continuously seek new ways to improve performance, protect reputational assets, and win shareholder and stakeholder trust. Lately, many academic studies have focused on evaluating the interest of the companies by analyzing these electronic sustainability reports of the companies ranked in Global Fortune 250 and Fortune 500 [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14].

In Turkey, sustainability reporting is also a new concept for the companies. In practice, there is a latest development which must be mentioned. Borsa İstanbul has signed a cooperation agreement with Ethical Investment Research Services Limited (EIRIS) to create BIST Sustainability Index. BIST Sustainability Index which has been launched on the 4th of November 2014 aims to provide a benchmark for Borsa İstanbul companies with high performance on corporate sustainability and to increase the awareness, knowledge and practice on sustainability in Turkey. The Index reflects companies' approach to important sustainability issues including global warming, draining of natural resources, health, security and employment, while allowing an independent assessment of their operations and decisions regarding these issues and, in a sense, their registration. EIRIS assessed BIST 30 constituent companies in 2014 and BIST 50 constituent companies in 2015 [15].

Since it is a new concept also in practice, there are few research related to sustainability reporting, but there is no research conducting on to understand the trend in sustainability reporting for the fortune 250 companies in the country. Altuntaş and Türker [16], made a content analysis for the sustainability report to understand their supply chain mechanism correctly. Kavut [17] also made a content analysis for the environmental directions in sustainability reports. Önce et al. [18] conducted some research to understand the number of sustainability reporting in Turkey. The purpose of this paper is to identify trend in sustainability reporting between 2004 and 2014 of Fortune 250 of Turkey, by analyzing their sustainability reports on their websites. This analysis is important to understand the practices of sustainability reporting in Turkey as no other study is conducted to discover changing trends between successful companies within the country. To accomplish this objective, a literature review was performed along with descriptive analyses of these practices for Fortune 250 of Turkey.

# 2. MATERIALS AND METHODS

This study aims to provide a descriptive analysis of trend in sustainability reporting among Fortune 250 companies of Turkey. The Fortune 250 lists covering the years 2004, 2006, 2008, 2010, 2012 and 2014 were taken from the website of Istanbul Chamber of Industry. The official websites of Fortune 250 companies of Turkey were accessed between 01/10/2015 and 31/10/2015. The website analysis consists of particularly the existence of sustainability report, the companies' existing webpage including their ideas and vision related to sustainability were also taken into account separately. The analysis followed the procedure including the search of industries and property of each company between 2004-2014. The study was repeated bi yearly in order to see the trend in sustainability reporting of Fortune 250 companies of Turkey. This study considered all types of sustainability reports published on companies' websites. Since the information related to the identities of the 41 companies was not provided, these organizations were excluded from the analysis. Excluding the exceptions mentioned, the sample was composed of the data gathered from the websites of the Fortune 250 companies of 6 years (2004, 2006, 2008, 2010, 2012 and 2014) consolidated and a descriptive statistical analysis was conducted. The statistical analysis provides a summary of:

- a) the difference in sustainability reporting among industries sorted by ISIC REV.2
- b) comparison of sustainability reporting in respect to the property of the companies
- c) the trend in sustainability reporting among Fortune 250 companies of Turkey between 2004-2014.

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### 3. RESULTS AND DISCUSSION

The percentage of companies which publish sustainability reports on their websites has increased dramatically between 2004-2014. When the age of the companies with sustainability reporting has been analyzed, it is founded that the average age of the companies in 2014 is 39, whereas it was 42 in 2004. It means, at first more structured and old companies started to publish their sustainability report, as the time passes younger companies have interested in sustainability reporting. According to number of employees, there is a great difference between the companies in respect to the existence of sustainability report in 2014. Average employee number of the companies with sustainability reporting is 3.461 and average employee number of the companies without sustainability reporting is 1.506.

Figure 1 presents a chronological evolution of percentage of organizations issuing a sustainability report between the years of 2004-2014. This study found that 4,8% of the sample issued a sustainability report in 2004, much lower than 38% reported in 2014. Also, in 2015, 40% of the companies have sustainability sections on their websites. In the last decade, since the awareness of the companies about environmental and social sustainability arose, the number of the companies which have sustainability reports has been growing in a remarkable way.

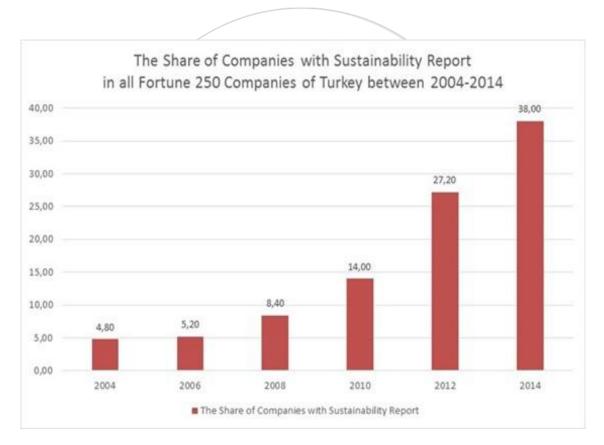


Figure 1. The Share of Companies with Sustainability Report in all Fortune 250 Companies of Turkey between 2004-2014.

Figure 2 shows, the industry patterns in 2014, the percentages of sustainability reporting per industry reveals a great difference with manufacture of transport equipment and food manufacture leading, followed by manufacture of electrical machinery, apparatus, appliances, supplies and iron & steel basic industries. Except for food manufacturing industry, the rest of the top sustainability reporting companies seems to be active in heavy industries.

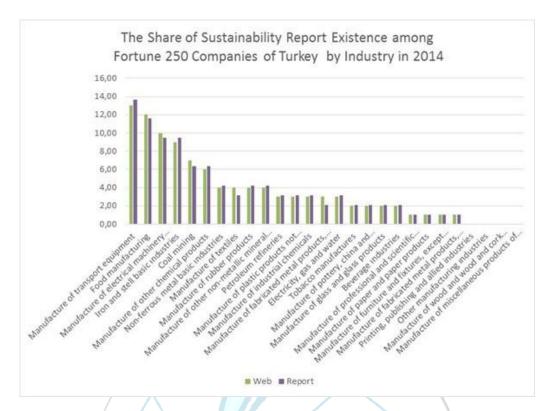


Figure 2. The Share of Sustainability Report Existence among Fortune 250 Companies of Turkey by Industry in 2014.

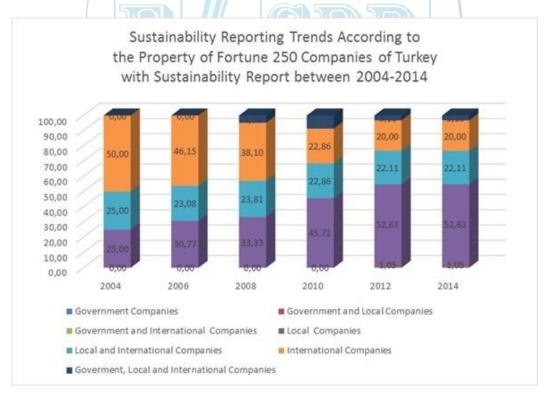


Figure 3. Sustainability Reporting Trends According to the Property of Fortune 250 Companies of Turkey with Sustainability Report between 2004-2014.

Figure 3 indicates the sustainability reporting trends according to the property of the Fortune 250 companies of Turkey with sustainability report between 2004-2014. A comparison of the companies in terms of property

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reveals a notable difference between 2004-2014. Within this period, while the percentage of international companies decreased relatively from 50% to 20% overall, for the local companies this changed from 25% to 52, 63%. The reason of this change can be explained by the growing awareness of environmental and social issues in a local perspective. Another implication which is drawn from Figure 3 is that companies including any international partnership have leaded sustainability awareness by publishing sustainability reports since 2004. When it comes to 2014, the explicit increase in the share of pure local companies with sustainability reports might be the result of the culture created by international companies.

### 4. CONCLUSIONS

This analysis reveals that sustainability reporting between 2004 and 2014 of Fortune 250 of Turkey, in order to that the sustainability reports on their websites has been searched. This analysis is the first study in order to understand the practices of sustainability reporting in Turkey as no other study is conducted to discover changing trends within the country. Interesting results of the study can be interpreted as follows;

- The analysis of Fortune 250 companies of Turkey between 2004-2014 has shown that, compared with 2004, reporting on environmental and social issues has increased significantly.
- During this period, it can be seen that the share of heavy industry manufacturing and local companies with sustainability reports increased in a considerable amount.
- Moreover, the capital structure of the companies with sustainability reporting has changed between 2004 to 2014, this can be interpreted that the sustainability reporting culture spread out by international companies to local companies.

A study covering Global Fortune 250 companies' comparison is suggested for the further studies.

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# A Wind Power Plant Feasibility Study for Bursa, Gemlik Region, Turkey

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Increasing energy demand on a global scale and with the emerging constraint of conventional energy resources has forced the developing countries to improve alternative energy sources. Especially in last decades, many studies and researches have been done in order to benefit more efficiently from renewable energy sources. Wind energy as a renewable energy source has showed a greater improvement since it is sustainable, efficient and clean energy. As a natural consequence of this development, the number of wind power plants (WPP) investments has been increasing expeditiously all around the world. Correspondingly, Turkey promotes the incentives and investments to the wind power conversion systems. Thus, the external dependence on energy of Turkey will decrease with these incentives and investments. In addition to that, competitive power of Turkey in the energy sector will increase dramatically. In this study, a WPP feasibility study is released for Gemlik Bay connected with Bursa Province in which has remarkable wind potential but has not any WPP. Wind data of Gemlik applied to Windsim software; annual energy production (AEP) and capacity factor are calculated. The study shows that through 5 Vestas V90 turbines with 2-MW capacity in Gemlik Ata region, establishment of an economic WPP which has over 40 GWh/y AEP capacity is feasible.

# **Key words**

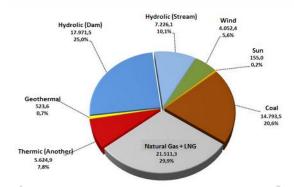
Gemlik Region, Renewable Energy Sources, Wind Energy, Wind Power Plant, Windsim

### 1. INTRODUCTION

Energy is the most important source for economic sustainability. Rapidly increase of population and industrialization resulted in an enormous energy demand all around the world. In order to meet this huge energy demand, investments in renewable energy sources have increased across the world. Nowadays, new energy investments are directed towards to clean energy. Renewable energy sources enable countries to meet energy requirements and protect environment with almost zero emission [1-3]. In addition, renewable energy sources are seen as a hope for economy of the developing countries.

Industrialization in Turkey is developing which respect to the developed countries. Turkey's main energy demand is increasing with a rate of 4-5% per year and this amount is causing 8% electrical energy demand [3]. Turkey's electricity generation by primary sources in 2015 is shown in Figure 1. According to Figure 1, Turkey meets its nearly 60% of energy demands from fossil fuel resources. Turkey is a foreign-dependent country in terms of energy. Turkey imports 72% of current energy sources to meet energy demand [3]. This issue brings along a current deficit problem and Turkey's economy sustains a serious loss and, also it causes negative effect on competitive power of Turkey on a global scale. The main reason of this situation is not used from domestic energy resources efficiently. If this problem is addressed, it can be said that investment in renewable energy sources is inevitable for Turkey's future.

Turkey has a prosperous geographical position and thanks to this feature, Turkey is a rich country in terms of renewable energy sources. Wind power as a renewable energy source, is one of the cleanest and the most environment-friendly energy source. All forms of energy production methods have negative environmental effect, but effects of wind power generation are very low. These effects of wind power are quite a little when compared with conventional energy sources. It is predicted that Turkey's technical and economic wind power potential are 83,000 MW and 10,000 MW respectively [4]. However, Turkey cannot benefit from this remarkable potential adequately. In this study, a wind power feasibility study is released for Gemlik region connected with Bursa Province where wind potential is currently high. The aim of this study is providing inputs to investors and policy makers for exploiting the wind potential of the region.



Established Power (2015): 71,858.5 MW

Figure 1. Turkey's electricity generation statistics [5]

# 2. MATERIALS and METHODS

Wind power plants are established and operated by considering some parameters. These parameters are wind power potential, accessibility and distance to energy transmission lines (ETL) and transformer stations. In this section, wind power potential in Bursa is evaluated by using Turkey wind atlases which have been developed by the Turkish Electric Affairs Etude Administration. Yearly average wind speed distribution and average wind capacity factor are given for the region. Also, the convenience of the region for WPP investment is analyzed in terms of roughness formation, distance to energy transmission lines (ETL) and transformer stations. Finally, site selection is performed for the WPP.

# 2.1. Assessment of Turkey's Wind Power Potential

Turkey is located in the northern hemisphere between the 36°-42° northern parallels and the 26°-45° eastern meridians. Thanks to its geographical position, Turkey has remarkable wind energy potential. In order to determine the wind power potential of Turkey, the wind atlases have been developed as shown in Figure 2 and Figure 3, below.

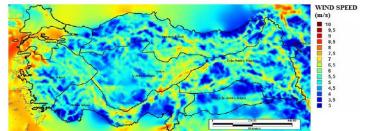


Figure 2. Yearly average wind speed distribution map of Turkey (50m) [6]

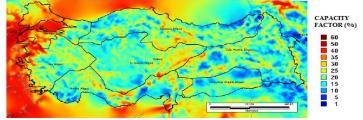


Figure 3. Average wind capacity factor in Turkey (50m) [6]

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According to Turkey wind atlases given in Figure 2 and Figure 3, the average wind speed at 50 meters elevation is approximately 7.0 m/s throughout of Turkey. In addition, Marmara region has the highest wind potential with the value of 7.0-9.0 m/s. For economical wind power plant investment, capacity factor must be 35% or more [7]. As shown in Figure 3, a great majority of Marmara, Aegean and East Mediterranean regions have more than %35 capacity factors. According to power density distribution as shown in Figure 4, the power density is in Marmara region changes between  $600 W/m^2$  and  $800 W/m^2$  at 50 meters elevation. Table 1 shows the wind power classes at 50 meters height above ground. According to Table 1, Marmara region is included in class 5 and class 6. If these parameters are considered, it can be said that Marmara region is the most suitable region in Turkey for WPP investment.

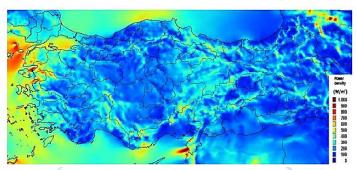


Figure 4. Yearly average wind power density at 50m [8]

Table 1. Wind Power Classification [9]

Wind Power Class	Wind Power Density( $W/m^2$ )	Wind Speed (m/s)
1	≤200	≤5.6
2	≤300	≤6.4
3	≤400	≤7.0
4	≤500	≤7.5
5	≤600	≤8.0
6	≤800	≤8.8
7	≤ 2000	≤ 11.9

# 2.2. Assessment of Wind Power Potential in Bursa, Turkey

Bursa is a large city in Turkey, located in northwestern Anatolia within the Marmara Region. It is the fourth most populous city in Turkey and one of the most industrialized metropolitan centers in the country [10]. In addition to these features, Bursa is a coastal city where connects to Marmara Sea. The coastal regions of Bursa are Mudanya and Gemlik respectively as shown in Figure 5.





Figure 5. Location of Bursa Province in Turkey and city map of Bursa [11-12]

In order to determine the field for WPP installation, wind potential of Bursa should be evaluated. In this context, it can be benefited from the wind atlases designed for Bursa region as shown in Figure 6 and Figure 7.

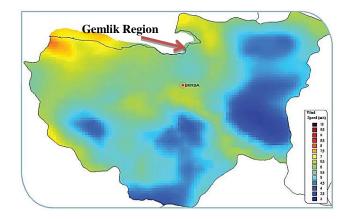


Figure 6. Average wind speed distribution map of Bursa (50m) [13]

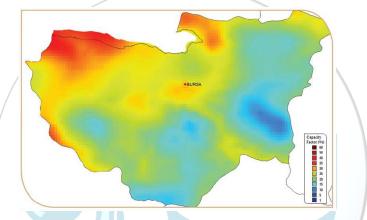


Figure 7. Average wind capacity factor in Bursa (50m) [13]

As shown in Figure 6, yearly average wind speed distribution in Gemlik region is 6.5-7.5 m/s. Also, average wind capacity factor is 35-40% as shown in Figure 7. If these two parameters are considered, it can be deduced that Gemlik is a suitable region for the WPP investment.

# 2.3. Assessment of ETL and Accessibility Parameters for Bursa Province

In order to provide an economical WPP establishment, accessibility and distance to (ETL) and transformer stations of the region should be analyzed.

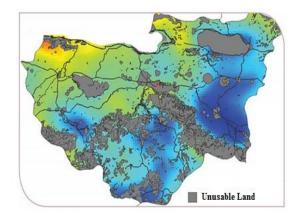


Figure 8. Unusable fields for the WPP in Bursa [13]

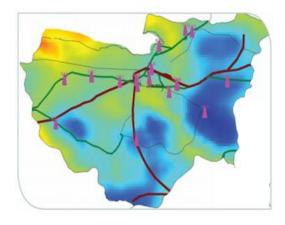


Figure 9. ETL and transformer stations in Bursa[13]

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Unusable fields for WPP investment is shown in Figure 8. According to Figure 8, Gemlik is a favorable region in terms of accessibility. ETL and transformer stations in Bursa are given in Figure 9. As seen in Figure 9, the most suitable region is Gemlik in Bursa in terms of distance to ETL and transformer stations. In order to determine the roughness formation of Gemlik region, it can be benefited from CORINE (Coordination of Information on the Environment) database with 100 meters resolution. The terrain roughness formation is given in Figure 10 by using CORINE database. If the roughness formation of Gemlik is analyzed, it can be said that the most favorable field is Ata region which given in Figure 11.

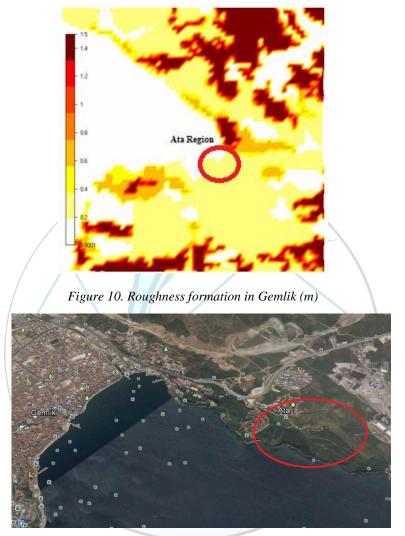


Figure 11. Ata Region in Gemlik

# 3. WIND FARM LAYOUT

In this section, a wind farm layout is designed for Ata region by using Windsim software. In order to gain 40 GWh/y or more AEP capacity, 5 Vestas V90 wind turbines are installed in the region by considering wake affect and air density changing. In addition to that, wind potential of the region is calculated by Windsim. Weibull distribution and its parameters are calculated for all sectors. Also calculated values are compared with the wind atlases.

### 3.1. Windsim Software

Windsim is wind energy software that uses computational fluid dynamics (CFD) to design and optimize wind turbine placement in onshore and offshore wind farms. Considering terrain conditions, the AEP amount of onshore and offshore wind farms can be calculated by Windsim. Windsim is powerful, world-class software based on CFD that combines advanced numeric processing with compelling 3D visualization. Through Windsim software, more accurate results can be obtained by taking turbulence, density changing, and topography-vegetation effects into account [14].

# 3.2. Assessment of Wind Power Potential for Bursa Province by CFD Analysis

In CFD analysis, the fluid is divided into finite volumes and the links which connects the volumes are represented by the nodes. For each element, mass conservation law and momentum conservation law are written. By combining these equations, Navier-Stokes equations are derived. Finally, Navier-Stokes Equations are solved by CFD method. As shown in Figure 12, Gemlik region is divided into 85,800 cells for the CFD analysis. According to CFD analysis, the average wind speed at 80 meters elevation is calculated as 9-12 m/s in Ata region as shown in Figure 13.

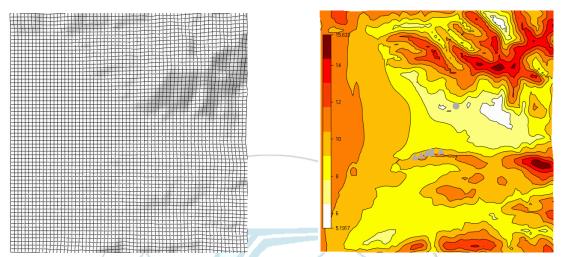


Figure 12. Grid structure of the region for CFD analysis

Figure 13. CDF analysis results at 80 meters.

# 3.2.1 Prospecting of Wind Energy Potential by Weibull Distribution Method

Weibull distribution method is one of the widely used statistical methods in wind data analysis [15]. Weibull distribution can be defined as a probability function f(v) and a cumulative distribution function f(v) represented by the following equations[16]:

$$f(v) = \frac{k}{c} \left(\frac{v}{c}\right)^{k-1} \exp\left[-\left(\frac{v}{c}\right)^{k}\right]$$
 (1)

$$f(v) = 1 - \exp\left[-\left(\frac{v}{c}\right)^{k}\right] \tag{2}$$

where k and c are the Weibull parameters and v is the wind speed. In these equations, k is the dimensionless shape factor and c (m/s) is the scale factor. According to wind resource analysis, Weibull distribution for the region is obtained as shown in Figure 14, below.

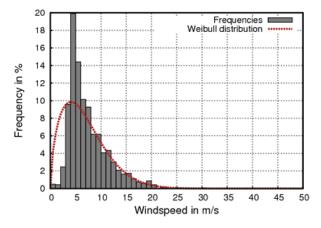


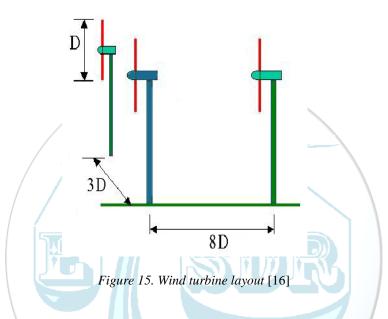
Figure 14. Wind speed frequency distribution with Weibull distribution for all sector

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According to Weibull distribution given in Figure 14, average wind speed is found as 7.41 m/s for 80 meters elevation. Also, Weibull parameters, shape factor and scale factor are calculated 1.57 and 7.67 respectively. Through CFD analysis, this value was found as approximately 10 m/s. It can be deduced that CFD analysis results and Weibull distribution results match well.

# 3.3. Turbine Layout

Turbine layout is performed by considering wake affect. Wake effect occurs when the wind turbines embower themselves. This phenomena affects the wind farm performance substantially. In order to prevent this situation, adequate separation distance at the dominant wind direction must be ensured between the wind turbines. As shown in Figure 15, wind turbines in the prevailing wind direction need a minimum distance of eight times the rotor diameter. At the vertical direction, the space in the prevailing wind direction should be three times of the rotor diameter to avoid each other's mutual interference.



In this study, Jensen's wake affect is used since it is effective in terms of converging [17]. By considering this layout proposal, the wind farm layout is designed by using 5 Vestas V90 wind turbines as shown in Figure 16.



Figure 16. Wind farm layout

### 4. ENERGY ANALYSIS

Wind farm energy analysis is calculated by Windsim software. According to energy analysis performed with 85,800 cells, AEP and capacity factor are calculated 45.0 (GWh/y) and 49.8% respectively. In order to verify the analysis, the results must be obtained independent of the cell number. The next phase of the study, cell number is increased until finding the cell independent results. The results of the new analyses are obtained as given in Table 2.

Table 2.7 may yes Results								
Cell Number	AEP(GWh/y)	Capacity Factor (%)	Wake Loss (%)					
85,800	45.0	49.8	3.1					
239,800	44.0	50.2	3.0					
541,200	43.6	49.8	3.1					

Table 2.Analyses Results

### **5. RESULTS and DISCUSSIONS**

According to Table 2, if the second analysis is compared with the last analysis; relative error at the capacity factor is found as 0.917% and relative error at the wake losses is 3.21%. If these values are evaluated, it can be said that the last analysis is pretty reliable. Apart from this, the WPP provides of being an economical WPP condition with 49.8% capacity factor.

In this study, the energy analysis of the WPP is performed by using the data which obtained from the measurement mast of Turkish State Meteorological Service. The height of this mast is 10 meters; on the other hand the hub height of the wind turbines is 80 meters. In order to extrapolate the wind speed to the hub height, Wind Power Law is used. However, this situation causes an error on the results. In addition to that, there is a significant distance between the measurement mast location and Ata region, Gemlik. In order to prevent this problem, a climate transferred mast was added into the region by using Windsim software. Also, in this study the cost analysis such as cost of turbine acquisition, installation and running cost along with grid connection is not considered. If these parameters are considered, truer results can be obtained.

# 6. CONCLUSIONS

Turkey's energy demand is increasing rapidly and Turkey imports the 72% of current energy which required for maintaining the production. This issue brings along a serious current deficit problem. Investment in renewable energy sources is inevitable for reducing the foreign dependence of Turkey. According to Turkey Wind Atlases which have been developed by the Turkish Electric Affairs Etude Administration, Turkey has 10,000 MW economical wind power potential. However, it cannot be efficiently benefited from this remarkable amount of energy. Through the investment of the wind energy conversion systems, Turkey's economy will develop in the long term and Turkey will have a big potential to compete with developed countries.

In this work, a WPP feasibility study is released for Gemlik region connected with Bursa Province where wind potential is very high but has not any wind power plant. The study shows that establishment of an economic WPP which has 43.6 GWh/y AEP capacity is feasible by using 5 number of Vestas V90 turbines with 2-MW capacity in Ata region, Gemlik. The main objective of this study is providing inputs to investors and policy makers for exploiting the wind potential of the region.

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# **Energy Efficiency and Policy Mix in the European Countries**

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Although countries have had concerns about energy security and energy supply for a long time, global warming and other environmental problems have led to increased interest in renewable energy use and energy efficiency only in the last decades. On the one hand, energy efficiency is important for cost-effective use of resources, overcoming environmental problems, and improving energy security. On the other hand, it is important for increasing living standards and life quality of inhabitants. Therefore, many countries have developed energy efficiency policies since 1970s. Among them, the EU countries appear as in a very good shape in policy design and innovation policies. Energy efficiency policies and their instruments are inherently complex due to the sectoral diversity, a variety of audience and uses. However, the success of a policy could largely depend on the process of policy making with regard to the characteristics of the policy, instruments and measures used, stakeholders involved and its targets. This paper aims to examine the effect of policy packages on the impact level of policies and to search if there is any efficient combination of policy instruments, based on the data of the MURE project which is a unique database on energy efficiency policy measures in 28 EU countries and Norway. First, the study provides an insight into the energy efficiency policies in European Countries by their sectoral distribution, targeted end-use and measure types to determine policy mix and policy trend. Later, it analyzes the policy packages to determine if the policy mix with respect to sectors, actors and measures has any effect on semi-quantitative impact levels of policies through cross-tabulations. The main finding of the paper is that the policy mix is crucial for policy success.

# **Key words**

Energy Policy, European Union, Energy Efficiency, MURE Project

### 1. INTRODUCTION

Energy is one of the most important inputs for economic growth and human development since it provides an essential ingredient for almost all human activities. Efficient energy use, on the other hand, is a cost-effective strategy for building economies without necessarily increasing energy consumption. Improving energy efficiency is an important priority in the policy agenda for all countries not only for economic reasons but also for many other reasons, such as environmental benefits, energy security and creating new jobs. Since energy

<sup>&</sup>lt;sup>1</sup> Energy efficiency improvements are more prudent use of scarce and polluting resources while simultaneously maintaining a certain level of output.

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efficiency represents the cheapest and surest means of curbing carbon emissions and saving money for other productive uses, national energy efficiency policies and measures and monitoring energy efficiency are seen today as the most important component of energy strategies of countries.

Besides, the European Union and its members are seen to be the world champion with respect to policy design, policy innovations and their energy efficiency outcomes despite some member states are among the world's largest energy consumers. As national policies of member states are heavily formed by the EU regulations and policies, the EU provides a roadmap for moving a low-carbon and energy-efficient economy by drawing clear targets on emissions and uses to members states. According to the Europe 2020 strategy approved by the European Council, it is targeted to increase energy efficiency by 20%, to reduce greenhouse gas emissions by 20% and to reach a share of 20% of energy from renewables in 2020 compare to 1990. The Energy Efficiency Directive (EED; 2012/27/EU) further specified that the EU-28 energy consumption for 2020 has to be no more than 1,483 Mtoe of primary energy or no more than 1,086 Mtoe of final energy. On 23 October 2014, the European Council decided on a new 2030 Climate and Energy Policy Framework including a binding EU target of at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990, and a share of at least 27% of renewable energy consumed in the EU in 2030 is binding at EU level. There are also sector-specific targets by the EU regulations.

According to Energy Savings 2020 report prepared by Wesselink, Harmsen, and Eichhammer (2010; 6), the EU's 20% energy savings target can be met largely through cost-effective measures but a tripling of policy impact is required. There are wide range of policy design with respect to their targets, actors, measures and other instruments in the EU members. The gap between the estimated opportunities in energy efficiency in sectors and achieved levels require examining energy-efficiency policies design and policy-making process in more detail in order to determine the characteristics of successful policy. In this context, the study's first objective is to examine policy design of the European countries where are seen as the leader in energy efficiency policy and in combating climate change, in order to identify the sector and the measure specific characteristics of energy efficiency policies and the recent trends in the region. The second objective is to determine if policy mix or policy packages with respect to their characteristics on actors, targets and measure types has an effect on the policy's impact on energy efficiency. For these objectives, we use the data of the MURE project which is a unique database that provides an evaluation of energy efficiency policy measures in the EU members, Norway, Croatia and the EU as a whole.

The next section describes and evaluates the main purposes and instruments of energy efficiency policies in sample countries. The third section assesses the energy-efficiency impacts of policy packages by their actors involved, measures used and end-use targeted through the average impact scores calculated from semi-quantitative impact levels. The final section concludes.

# 2. THE DESIGN OF ENERGY EFFICIENCY POLICIES: PURPOSES AND INSTRUMENTS

There have been implemented numerous energy efficiency policy instruments among countries, the energy gains compared to potential still limited, and the impact of policies varies across policies and countries (Morvaj and Bukarica, 2010) because of components of policies as well as the importance of other drivers in energy saving such as technologic innovations (Huber and Mills, 2005; Hogan and Jorgenson, 1991) and the increase in energy prices (Sutherland, 2003) as argued by some authors. When enforcement can be secured, mandatory and regulatory measures are generally the most cost-effective ways of increasing the energy efficiency on a long-term basis (UNDP, 2009; Erdogdu, Karaca, & Kurultay, 2015).

Taking into account of the energy efficiency gap between the observed level of energy efficiency and the potential of energy efficiency, this gap and therefore the need for policy intervention in energy markets mostly are explained by market and behavioral failures (Gillingham, Newell and Palmer, 2009; Shogren and Taylor, 2008), despite of some critics which argue that all market failures and barriers are not problem that should be overcome or can be overcome cost-effectively (Geller and Attali, 2009). Gillingham, Newell and Palmer (2009) classify potential failures and policy options as energy market failures (policy options are fiscal and new market-based instruments), capital market failures (policy options are financial and loan instruments), innovation market failures (policy options are fiscal and financial instruments), information problems (policy options are information programs) and behavioral failures (policy options are educational and informational instruments and legislative-normative measures as product standards).

In this paper, we examine the European countries which are seen to be having the developed policy designs and to be having enormous energy gains from policies through the MURE database. The first policies that appear in the MURE database are "farm land re-parceling project" of Finland in 1917 and "speed limits and active traffic management" of UK in 1934. Until 1990, there were only 86 policies according to the MURE database. The energy-efficiency policies have mainly began to increase from 1990s, and at mid-2000s, the number of policy

has reached at its highest level, despite of relatively decrease after 2009 (the decrease can be seen to be partly due to data availability in the MURE database). There has been a continuous increase in the number of measures that have come into force every year until 2009. The increase is valid for all sectors, but the least increase was experienced in the industrial sector. The policy number for all years and all sectors is 2382 as of August 2015 when the data was collected for this study. The largest part of policies is those related to energy efficiency in the household sector. Policies without the semi-quantitative impact estimation are about 13% of the total. The largest number of policies consists of measures addressing energy-efficient in the household sector by 28% as share of total policies (663 policies as frequency). The second largest number of policies is those which address transport and tertiary sectors. The share of transport and tertiary sector policies is quite similar and 22% (528 policies for transport and 524 policies for tertiary) with respect to policy numbers. Policies toward the industrial sector and general cross-cutting sector are again same as 14% as a share of total policies (334 policies for general cross-cutting and 333 policies for industrial sector). The MURE database also publishes semi-quantitative impact evaluations of 86 percent of policies (with 2055 at frequency). All sectors have the impact evaluation above 87% except general cross-cutting sector by 76%.

Taking together households and tertiary sector, policies which tackle buildings consist of a half of total policies. EC Directorate-General for Energy (2012) has also recognized that buildings must be central to the EU's energy efficiency policy. Studies have generally indicated that since there is currently a high final energy demand for heating and cooling in the residential and tertiary sector, energy saving potential in the buildings (especially from refurbishment of existing buildings) is rather high compared to other sectors (Eichhammer, et al. 2009; Boßmann et al. 2012).

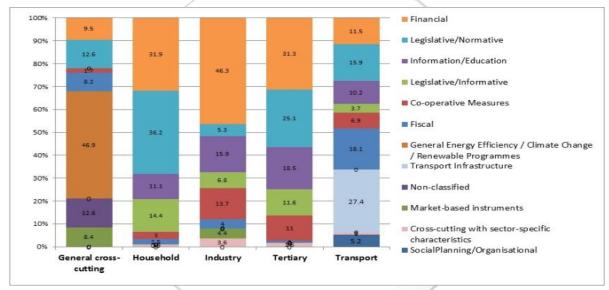


Figure 1. Measures by Sectors

Figure 1 illustrates the distribution of measures by sectors. In the general cross-cutting with sector-specific characteristics which cover mostly all sectors with the same type of instruments, the most commonly used measures are the general programmes on energy efficiency, climate change or renewables. Also, legislative/normative measures such as regulation or mandatory targets become more important, while market-based instruments are on the rise.

In the household sector, legislative/normative (in particular building regulation) and financial measures (addressing mainly existing buildings) are dominant in policies, while the informative policies (legislative informative and information/education) consist of one-fourth of policies and especially legislative/informative measures such as labels have decreased in importance recent years in the consequence of the fact that the very comprehensive labelling policy for the electric appliances has not been renewed. However the Eco-design Directive 2005/32/EC is expected to give a further push to this measure type (ADEME, 2009).

Tertiary sector is similar to household sector in terms of distribution of policies, because both are related to the buildings. However, informative and cooperative measures in tertiary sector play a larger role compared to household sector. Moreover, legislative/informative measures such as labels increase in importance. In industrial sector, the financial measures are in the core of policy mix by 46 percent. The second largest part of measures is informative and cooperative ones such as information/education, cooperative and legislative/informative measures. In transport sector which consumes energy at the highest level with responsibility of inducing one-fifth of CO2 emissions in the EU (AEA, 2012), it is used wide range of measures, as it is not dominated by two

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or three measure types. But it can be said that the measures with related to infrastructure, fiscal and legislative measures tend to be more largely employed. Regulation and co-operative measures are on the rise. General cross-cutting measures cover mostly all sectors with the same type of instruments (ADEME, 2009).

Considering how changes the policy mix over time by sectors, it can be said that the financial measures have always dominant in the industrial sector, although the share of financial measures has declined after 2000 compared to before 2000 from 42.5% to 46.3. Another declining instrument is legislative/informative measures from 5.1% to 6.8. On the other hand, the information/education, cooperative and new market-based measures have increased as a share of total policy in the industry. It can be said there is slight tendency toward using informational - cooperative measures and new market-based instruments in the industry. Although most countries have also at least one new market-based instrument, there are a few countries which do not have this kind of measures (ODYSSEE-MURE, 2015).

Financial and legislative measures are dominant in the building sector. However, comparing after-2000 and before-2000, there is a slight increase in legislative/informative measures and fiscal measures for household sector, on the other hand, for tertiary sector, as the financial measures and information/education have increased respectively from 31.3% to 33.4 and from 18.1% to 18.5, legislative normative measures have decreased by 3 percentage points.

In transport sector in which policy efforts intensify on mobility paradigm in transport, using new technologies in vehicles and transport systems, encouraging modal shift toward less energy intensive modes like public transport and improving transport infrastructure systems with regard to energy efficiency and environmental sustainability (ADEME, 2013; EC, 2011; Marcucci, Valeri and Stathopoulos, 2012), it is dominantly implemented infrastructure, fiscal, information/education and legislative/normative measures. Comparing after-2000 and before-2000, the legislative measures (informative and normative) have increased from 19.5% to 22.5% despite of slight decreases in all measure types except of a slight increase in social planning/organization types of measures.

# 3. POLICY PACKAGES AND THEIR SEMI-QUANTITATIVE IMPACT

One of the most important advantages of the MURE database is that it publishes the impact evaluations of a policy in semi-quantitative categories as having high impact, medium impact and low impact based on quantitative evaluations or expert estimates, with respect to energy savings achieved by the policy. This is quite valuable information to judge the success of a policy.

The information on the impact level could also be used to consider the success of a mix of policy instruments such as actors involved, measures employed and targeted-end-use of policies, when the multiple actors are used in a policy. In this case, an option is to compare how much policy has the highest impact as percentage of total policy or how much of them in the lowest impact level for related categories. Another way is to develop a score on impact levels to compare categories. We prefer the second option by calculating simply the average impact score for comparison purposes. Accordingly, we assign the coefficients for 1 for the low impact, 2 for the medium impact and 3 for high impact in an instrument, and then divide total value by the frequency of the category respective.

In the case that a policy can contain more than one instrument such as actors, measures and targets of the policy, evaluating the policy packages with regard to their impacts could reveal important information to discover successful combinations of instruments. In this section we examine policies by actors, measures and targets to consider the successful combinations of these instruments.

### 3.1. Policy Packages by Actors and Their Impact Levels

In this section, we consider how often an actor is involved in a policy and what are the actor combinations of policies, taking into account policies mostly contain multiple actors. MURE database classifies actors as central government, energy agencies, financial institutions, industries, local governments, utilities, employers, energy suppliers, manufacturers, professional associations, trade associations, associations, transport companies and vehicle companies. We combine this classification into 7 categories as central government, local authorities, energy agencies, energy suppliers, financial institutions, associations (all types of associations), companies (industries, utilities, employers, manufacturers, transport companies and vehicle companies) by their functions. Considering how often an actor was involved in policies, actor who is used the most commonly in policies is central government, as central government is found in 44 percent of all policies considered. Central government is followed by local governments (15%), energy agencies (14%) and companies (14%). Associations (7%), financial institutions (3%) and energy suppliers (3%) are quite less found in policies.

Table 1. Distribution of Actor Combinations of Policies

Actor	%	Actor	%
Only Central Government	38.8	Government/Companies	8.3
Central and Local Government	7.3	Government/Energy Agencies	7.8
Only Local Government	5.1	Government/Associations/Companies/Energy Agencies	2.7
Only Energy Agencies	4.1	Government/Companies/Energy Agencies	2.7
Only Companies	3.7	Government/Associations	2.2
Only Associations	1.0	Government/Financial Institutions	1.5
Only Energy Suppliers	0.5	Government/Associations/Energy Agencies	1.4
Only Financial Institutions	1.2	Government/Energy Suppliers	1.2
Associations/Companies	1.3	Government/Energy Agencies/Financial Institutions	0.9
Companies/Energy Agencies	0.8	Government/Associations/Energy Suppliers	0.8
Associations/Energy Agencies	0.6	Government/Companies/Energy Agencies/Energy Suppliers	0.7
Associations/Companies/Energy Agencies	0.3	Government/Associations/Companies	0.6
Energy Agencies/Energy Suppliers	0.3	Government/Energy Agencies/Energy Suppliers	0.6
Other	3.2	Government/Associations/Companies/Energy Agencies/Financial Institutions	0.4

Since a policy could be conducted by participation of more than one actor, we also consider actor combinations in policies to avoid double counting of actors. As Table 1 below indicates, the actor contents and combinations of policies, more than half of all policies (54.4%) were conducted by a single actor. Inherently the central government alone is the most active participant of policies by 38.8 percentages. On the other hand, when central government and local government are considered together, 51.2% of the all policies are conducted by only general government. The right column of Table 1 shows collaborations of the general government (central government and/or local government) with any other actor. As could be expected, the government is involved in almost all policies. The most important partner of the government is companies (8.3%) and energy agencies (7.8%).

Figure 2 compares the average impacts of actor combinations on energy efficiency through a simple impact score. The single-actor policies are shown in Figure 2 with regardless their frequency. However, the categories which have less than 1% of frequency are counted in the category "other".

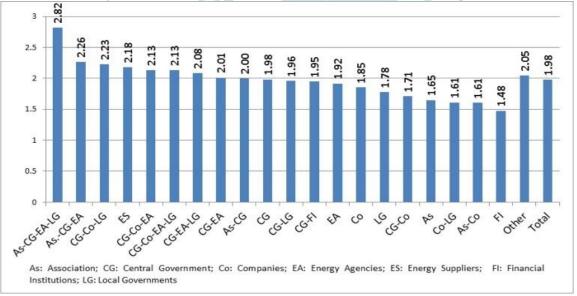


Figure 2. Impact Scores of Policies by Actors

As can be seen from Figure 2, the most successful actor collaboration is clearly those which among associations, central government, energy agencies and local governments with regard to impact score. While policies which conducted by the central government alone produce 1.96 of the impact score, the cooperation of the central government with other actors generally produces higher impact except of the collaboration of central government with corporations. Central government-corporations cooperation produces the higher impact if only

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there is another actor in the policy such as central government-corporations-local government, central government-corporations-energy agencies and government-corporations-energy agencies-local governments. Among the policies with single-actor, the most successful one is seen to be the policies which conducted by energy suppliers. But it should be kept in mind that the assessment was made only with 11 frequencies.

In general, it can be said that policies which is conducted by associations, energy agencies and/or companies in addition to the central government and/or local government are more successful rather than policies implemented by the single-actor. Policies without central government generally produce lower impact score with exception of the cooperation central government and companies.

### 3.2. Policy Packages by Measure Types and Their Impact Levels

Next, we assess the distribution of measure types among policies, their combinations and their impacts on energy efficiency. The MURE database classifies measures into eleven categories as cooperative, cross-cutting measures with sector-specific characteristics, financial, fiscal, information/education, legislative/informative, legislative/normative, market-based measures for only industry sector, and two measure types as infrastructure and social planning/organization for only transport sector.

Measure	%	Measure	%
Only Financial	23.81	Other	5.91
Only Legislative/Normative	19.04	Financial-Fiscal	2.23
Only Information/Education	10.86	Leg/Informative - Leg/Normative	1.95
Only Co-operative	6.91	Financial - Information/Education	1.50
Only Legislative/Informative	6.86	Financial - Leg/Normative	0.10
Only General Programmes	6.18	Cooperative- Information/Education	0.07
Only Fiscal	5.09	Fiscal - Leg/Normative	0.05
Only Infrastructure	3.82	Information/Education - Leg/Informative	0.05
Only Market-based	1.64		
Only Cross-cutting	1.27		
Only Social Plann/Org.	0.41		

Table 2. Distribution of Measure Combinations of Policies

Considering how often a measure type is used in policies at the expense of the risk of double counting policies, the measure types which are used the most frequently are financial measures (29%), legislative/normative measures (23%) and information/education measures (15%). Market-based, infrastructure and social planning/organization measures which are specific to particular sectors (the first is to industry sector and the other two are to transport sector) are inherently used the less frequently.

Table 2 considers the distribution of measure combinations to find out how often measures are used alone or together with other specific measure type. As policies which have lower frequency than 10 were combined in the category "Other", this category consists of a variety of the measure combinations. As can be seen, the vast majority of policies contain the single-measure type (86%). Policies which use a combination of several measure types are 14% of total policies. The most widely used measures are only-financial measures (24%), legislative/normative measures (19%) and information/education measures (11%). The most frequently used measure combinations are financial-fiscal measures (2.23% and 49 of frequency), legislative/informative-legislative normative measures (1.95% and 43 of frequency) and financial-information/education measures (1.15% and 33 of frequency).

For examining the impact levels of measures combinations, we again calculate a simple impact score following the method used for actor combinations. Figure 3 shows comparative impact scores of policies by measure types used in. Accordingly, the most successful measure combinations are fiscal-legislative/normative, financial-legislative normative and legislative informative-legislative/normative measures, however they have low frequency. Successful measure combinations are generally those which supported by "legal / normative" measures. Only-legislative/normative measures also have the impact score above average. The most unsuccessful combinations are cooperative-information/education and information/education-legislative/informative. In general informative (legislative or not) and cooperative measures associated with lower impact with except of the combination of legislative/informative measures with legislative/normative measures.

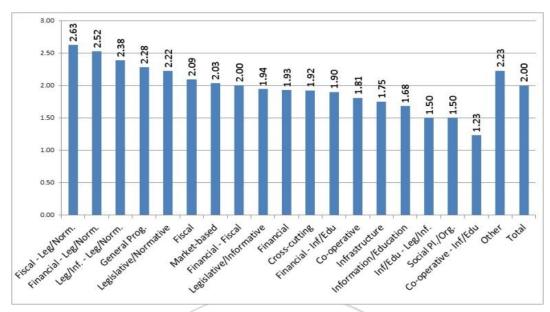


Figure 3. The Impact Scores of Measure Combinations

The financial measures which are used the most frequently in policies shows the impact below average when they are used alone. Financial measures are more successful when it is used together with legislative/normative measures and relatively fiscal measures. It should be remembered that besides their impact on energy efficiency, financial and fiscal measures are also criticized to be regressive their effect on income distribution (Brookes, 2000; Sutherland, 2003).

Policies with single measure are higher impact in the case of the general programmes and legislative/normative, while they fail in the case of social planning/organization, infrastructure, cross-cutting with sector-specific characteristics and financial.

# 3.3. Policy Packages by Targeted End-Uses and Their Impact Levels

Finally, in this section we examine the distribution of targeted end-use of policies, target combinations and their impacts on energy efficiency. The MURE Project publishes detailed information on targeted end-uses of policies. Some targets are only related to sector-specific characteristics. For the household and the tertiary sectors, it is mostly targeted energy efficiency in buildings such as targets which is aimed to appliances, heating, cooling, lighting etc. While the sector industry contains process-related targets such as electric motors, process heating cooling as well as space heating, cooling etc., in the transport sector, a series of sector-specific targets are used such as those aimed at driver behaviors, mobility, modal shift, technical and non-technical ones. On the other hand, all sectors share the categories of general targets as total electric consumption, total final consumptions and total fuel consumptions.

Examining the percentage of being included of a target in policies, the most frequently targeted end-uses are total final consumption among these general targets (32.5%). Other general targets are also used commonly in policies. Following these targets, the categories of space heating/cooling (13.5%), the appliances/cooking/hot water (7.9%) and the lighting (5%) are common across policies. However, as can be recalled from the other section, these general figures may be misleading because of double counting of policies if they include more than one target. Therefore, we examine target combinations by eliminating double count problem in Table 3.

The left column of Table 3 presents the single-target policies as a share of total policies, while the right column sorts target combinations for the multiple-targeted policies. Policies which have lower frequency than 10 were combined in the category "Other". Accordingly, the majority of policies contain the single-measure type (67%), while the majority of the multiple-targeted policies have the less frequency within the category "other". Among the single-targeted policies, total final consumption is clearly one that is used the most frequently. Following the target of total final consumption, the 7.5 percentage of policies targets the total fuel consumption and the 6.7 percentage of policies targets space heating/cooling. The most common combinations are the combination of the appliances/cooking/hot water and the space heating/cooling (3.6%), the combination of the space heating/cooling and the total final consumption (2.3%) and the combination of the appliances/cooking/hot water, the space heating/cooling and the total final consumption (1.3%). Targets related to transport such as technical and behavioral are generally together with total fuel consumption.

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Table 3. Distribution of Target Combinations

<b>Target Combination</b>	%	<b>Target Combination</b>	%	
TFinalC	37.48	Other	22.24	
TFuelC	7.52	ACH & SHC	3.57	
SHC	6.68	SHC & TFinalC	2.33	
		ACH & SHC &		
TElecC	3.96	TFinalC	1.3	
TecTRA	2.92	TecTRA & TFuelC	1.17	
		TElecC & TFinalC &		
Lighting	2.27	TFuelC	1.17	
ACH	1.75	BehTRA & TFuelC	1.1	
OTU	1.75			
BehTRA	1.1			
MsTRA	0.84			
Process	0.84			
ACH: Appliances/cooking/ho	t water	SHC: Space heating/coo	oling	
		TecTRA: Technical	in	
BehTRA: Behavior -in Trans	port	Transport		
MobTRA: Mobility in Transp	ort	TElecC: Total Elec. Cons.		
MsTRA: Modal shift in Trans	TFinalC: Total Final Cons.			
OTU: Other Targeted Uses	TFuelC: Total Fuel Con	S.		
Process: Process heating, coo	oling, el.			
gen.				

For examining the associations between the impact levels and the target combinations, we again calculate a simple impact score following the method used for actor and measure combinations. Figure 4 shows comparative impact scores of policies by targets used in. As can be seen from Figure 5, the highest impact score is for the combination of appliances/cooking/hot water, the space heating/cooling and the total final consumption. Among the single-target policies, ones which aimed at lighting are the most successful. In general, targets related to building sector such as lighting, total electric consumption, space heating/cooling have the higher impact levels, while policies with transport-specific targets are unsuccessful with regard to their impact scores. Among transport-specific targets, the most successful one is behavioral targets, but it has higher impact if it is used with total fuel consumption target.

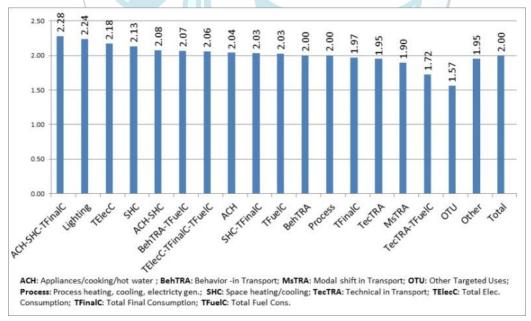


Figure 4. The Impact Scores of Targeted End-Use Packages

Among targets aimed at general energy efficiency (total final consumption, total electric consumption and total fuel consumption), total electric consumption is the most successful, while total final consumption is the less successful one, when they are used alone. Total final consumption has higher impact if it is used together with targets the appliances/cooking/hot water and the space heating/cooling instead of using alone, while the fuel consumption has higher impact if it is used together with behavioral targets for transport instead of using alone.

### 4. CONCLUSION

We have evaluated the policy contents with respect to their impacts on energy efficiency by actors, measure types and targets. The most successful actor collaboration clearly appears as those which among associations, central government, energy agencies and local governments. The cooperation of the central government with other actors generally produces the higher impact except the collaboration of central government with corporations. Policies without central government generally produce lower impact score with the exception of the cooperation central government and companies.

For measure types employed in policies, the most successful measure combinations are fiscallegislative/normative, financial-legislative normative and legislative informative-legislative/normative measures. Successful measure combinations are generally those which supported by "legislative/normative" measures. Only-legislative/normative measures also have the impact score above average. When enforcement can be secured, mandatory and regulatory measures are generally the most cost-effective ways of increasing the energy combinations are cooperative-information/education efficiency. most unsuccessful information/education-legislative/informative. In general informative (legislative or not) and cooperative measures associated with lower impact with except of the combination of legislative/informative measures with legislative/normative measures. The financial measures which are used the most frequently in policies shows the impact below average when they are used alone. Financial measures are more successful when it is used together with legislative/normative measures and relatively fiscal measures.

With regard to target packages of policies, the highest impact score is for the combination of appliances/cooking/hot water, the space heating/cooling and the total final consumption. Among the single-target policies, ones which aimed at lighting are the most successful. In general, targets related to building sector such as lighting, total electric consumption, space heating/cooling have the higher impact levels, while policies with transport-specific targets are unsuccessful with regard to their impact scores. Among transport-specific targets, the most successful one is behavioral targets, but it has higher impact if it is used with total fuel consumption target.

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# Education of local governments as a way towards sustainable development of the countries of the Western Balkans - Case Study of Montenegro

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There is an urgent need of capacity building in sustainable development in the Western Balkans Countries. Thus, education and training are necessary elements to make municipality administration capable to recognize, define, prepare, and finalize any kind of the energy efficiency projects, from the simple ones up to technically and particularly financially complex projects, particularly taking into consideration today very attractive concepts of the projects financing, as ESCO's, PPP, etc. This paper presents the activities on the TEMPUS project Training courses for public services in sustainable infrastructure development in Western Balkans (Project Number: 530530-TEMPUS-1-2012-1-SE-TEMPUS-JPHES), in the Montenegro, as case study. The project is designed to establish system for training of public authorities aimed at improving level of environmental expertise, facilitating good governance and sustainable development in Western Balkan countries. In that sense, for capacity building of staff at public authorities in sustainable development, particularly energy efficiency in the public buildings, management in the renewable energy sources at University of Montenegro -Faculty for Mechanical Engineering in cooperation with Union of Municipalities of Montenegro two training programmes are designed, developed and implemented. Key teachers were being retrained at EU universities and they disseminated their new knowledge to colleagues, so the capacities of University of Montenegro in providing training in sustainable development have been significantly improved. Strong connection between University of Montenegro and Union of Municipalities of Montenegro has been established. All these things contributed to creation of the system for continuous development of the knowledge, skills and competencies of the staff of public authorities. A webbased toolkits as an interactive learning environment for training of public authorities was developed during the project implementation.

# **Key words**

Education, Energy efficiency, Sustainable development, TEMPUS, Training

### 1. INTRODUCTION

This paper presents the activities on the TEMPUS project under title "Training courses for public services in sustainable infrastructure development in Western Balkans" (Project Number: 530530-TEMPUS-1-2012-1-SE-TEMPUS-JPHES)-SDTRAIN. The paper will be an emphasis on activities that were implemented in this project in the Montenegro.

It is more than obvious that there is an urgent need for capacity building in the Western Balkans Countries (WBC) in the area of sustainable development. Because public authorities on all levels (local, regional and national) do not have the necessary level of knowledge on topics such as energy and the environment. This disadvantage is a very serious barrier to sustainable development of these countries. The analysis of the situation in terms of administrative capacity in the Western Balkans came

to the conclusion that local governments of cities have major problems when it comes to skills and competencies of employees in this area. Thus, education and training are necessary elements to make municipality administration capable to recognize, define, prepare, and finalize any kind of the energy efficiency projects, from the simple ones up to technically and particularly financially complex projects, particularly taking into consideration today very attractive concepts of the projects financing, as ESCO's, PPP, etc.

Analysis of interviews in all WBC demonstrated a need in networking between Local Authorities and Universities. Since many energy managers and environmental officers at municipal level work alone, a contact with the specialists in that area from Universities could be a big help when difficulties arise.

The SDTRAIN project proposal was finalized during the NALAS Task Force on Energy Efficiency meeting in Vienna on 6-9 February, 2012. NALAS is a network of associations of local authorities of South East Europe, which bring together 15 Associations which represent roughly 4000 local authorities. Interest of NALAS and its WBC members in the SDTRAIN project proves its high relevance to the needs of society.

The project is designed to establish system for training of public authorities aimed at improving level of environmental expertise, facilitating good governance and sustainable development in Western Balkan countries, and in particular in Montenegro, Serbia and BiH.

### 2. DESCRIPTION OF THE CONSORTIUM THAT IS CARRIED OUT THE PROJECT

The project consortium consist of:

I-European Universities that are proactive in realization their commitments towards sustainable regional and local development: KTH Stockholm, TU Delft and UPC Barcelona.

The EU partners have broad experience in organization of training courses for public authorities within national and international projects and in organization of training cources municipalities and other stakeholders on regular basis. They iniated a European network of Universities and cities aimed at development of green and resilient urban areas.

KTH introduced a set of training courses aimed at local and regional authorities in Baltic Sea Area within Interreg IIIB project. They also have expirience of such international courses for public authorities in Russia, Belarus and Ukraine.

UPC provides training courses in sustainable urban development, public administration and good governance both nationaly and internationally.

TU Delft provides training courses for various actors and expertise in public participation in decision-making processes, and conducts stake holders' workshops focusing on sustainable development of local and regional infrastructure.

Originally it was planned that Polito is part of a consortium but by the end of the project did not take active participation. Polito is working on development of energy infrastructure in WBC and training of relevant stakeholders in this area.

II- Five universities from WBC: Serbia (2), Bosnia and Hercegovina (2) and Montenegro (1) that have experience in retraining and were approaching by public authorities for organization of training courses in sustainable public infrastructure.

In BiH: the project team conducted evaluation of need in training of local authorities supported by SIDA, University of Banja Luka (UBL) participated in development of strategic document on the level of Republic of Srpska and Bosnia and Hercegovina such as Air Quality Strategy for Republic of Srpska, UBL cooperates with associations of the local authorities of BiH and its experts participate in the Council of Climate Changes of City of Banja Luka and in development of Sustainable Environment Action Plan.

University of East Sarajevo (UES) is having extensive experiences in cooperation with public and private stakeholders in the sphere of energy efficiency within projects financed by the World Bank, NNTU and national funds. Lifelong learning activities have a strategic focus at UES. UES is located in 10 towns, which contributes to the faster development of these towns.

In Serbia project team has strategic cooperation with Association of Towns and Municipalities of Serbia that expressed the need of staff training of their members in sustainable urban development and energy efficiency. University of Belgrade (UB) put a high priority on supporting development of sustainable energy system in Serbia. Experts of Faculty of Mining and Geology and Mechanical Engineering have been involved in preparation of few strategic Serbian documents and they have managed projects related to energy efficiency improvement and RES utilization for Serbian municipalities. University of Kragujevac (UKG) is located in Kragujevac, the centre of Šumadija Region, while other five faculties are located in four towns of Central Serbia-covering the area with more than 2,5 mil inhabitants. UKG and its Euro Energy Efficiency Centre has extensive cooperation with local authorities, the Regional Chamber of Commerce in Kragujevac, the Energy Efficiency Agency of Serbia, the Ministry for Environment and companies that have a great need of training in the field of sustainable development, environmental protection, energy efficiency, energy management, eco-management, finacial regulations in the field of energy and renewable energy and the environment.

In Montenegro: the project team cooperatates with Union of Municipalities of Montenegro. One of the Union's goals is to develop and improve education of citizens and local government officials.

University of Montenegro is the only public university in the country. Faculty for Mechanical Engineering has a good experience in organization of postgraduate studies in energy efficiency. The Faculty held several courses on the theme of

energy efficiency for the Ministry of Economy Staff members enrolled in SDTRAIN has a significant experience in energy efficiency, renewable energy sources, etc.

III. Society partners of the project are Associations of local authorities of partner countries, which members are main target group of retraining:

- The Union of Municipalities of Montenegro (UOM) is association of all 21 municipalities,
- Association of Towns and Municipalities of Serbia that consists of all local governments in Serbia,
- Association of municipalities and towns of Republic Srpska (BiH). The Association of Federation of Bosnia and Hercegovina had organizational problems in participation as a full partner but it is willing to participate in the project activities as well as municipalities of Novo Sarajevo, Kakanj and Mostar.

Participation and great enthusiasm of these society partners prove high relevance of the SDTRAIN project to society needs; it will ensure sustainability of the project results, effective quality control, visibility of the project among relevant organizations and institutions, which are potential customers of the developed training resources.

### 3. THE PROJECT'S CONTENTS AND METHODOLOGY

The project is designed to establish system for training of public authorities aimed at expertise in the area sustainable development in WBC, particularly in BiH, Serbia and Montenegro. To reach this goal the training programme for capacity building of the staff of public authorities in sustainable urban development, sustainable energy infrastructure and good governance have been developed at partner Universities in cooperation with EU partners and Associations of Local Authorities. In order to develop and sustain the study programme and courses at the partner Universities capacity building activities for teachers and tutor as well as decision-makers from society partners were taken place at the beginning of the project.

During the developing the courses, the working group were taken to account target group of courses-employees of the public authorities and their specific needs like flexibility in time and pace of the training.

#### 3.1. Activities carried out

Kick-off meeting took place at UB on 28-30 November 2013 with participation of all academic and non-academic partners except Politecnico di Torino (*Figure 1.*). The project SDTRAIN and the project partners were presented and discussed to ensure the common understanding of the project goals and roles of each partner. The management procedures were settled. Steering Committee has been assigned. Criteria for selection of mobility participants have been settled.

The detailed work plan has been agreed and documented in the form of minutes. Tables of achieved results are given in the below:

Table 1. WP1: Development of training courses, teaching tutorials and interactive teaching methods

Activity N°	Activity Title	Start date	End date	Place	Description of the activity carried out	Specific and measurable indicators of achievement
1.1.	Training of teachers/ tutors at EU universities	Nov 2012	Feb 2014	TU Delft, KTH – Stockholm, UPC - Barcelona	During study visits to EU partner universities UoM teachers were retrained in specific topics related to training program development. Teachers from UoM established direct links with EU teachers responsible for the particular courses. For the training program Energy Efficiency in Public Building with UPC Barcelona-Tech, and for Renewable Energy-Management with the TU Delft	6 retrained UoM teacher 10 lectures 7 workshops 3 visits to examples of good practice
1.1.1.	Study visit to TU Delft, NL	25 Feb 2013	01 Mar 2013	TU Delft, NL	The study visit to TU Delft included: - Lectures related to course development: Local energy production (A. van Timmeren, TU Delft) Multi-Source Multi-Product (Kas Hemmes, TU Delft) Backcasting and energy management (J. Quist, TU Delft) Energy potential mapping (Siebe Broersma, TU Delft) Modeling local energy systems (Igor Nikolic, TU Delft) Renovation, energy efficiency and contracts (Tadeo Baldiri Salcedo Rahola, TU Delft) Local Energy Visions (Ellen van Bueren, TU Delft) - Workshop about teaching methods: Micro-training (Mariette Overschie, TU Delft) - Visits related to course development: Kersentuin (Cherry Garden) sustainable urban area The Hague - Geothermal energy project (Figure 2.) The Hague University of Applied Sciences – the building and its sustainable technologies Municipality of Delft - Presentation about the municipal energy policy and visit of Woonbron and Poptahof,	2 retrained UoM teacher 7 lectures 3 visits to examples of good practice
1.1.2.	Study visit to KTH,	13 May 2013	17 May 2013	KTH, SE	The study visit to KTH (Figure 3.), Stockholm included: - Visits related to course development: Norra Djurgardsstaden	3 retrained UoM teacher 3 lectures

	Stockholm, SE				Hammaraby Sjostad	3 visits to examples of
					Jarva - Lectures related to course development:	good practice
					Overview of ELEF project	
					- Coordination meetings (Olga Kordas, KTH)	
1.1.3.	Study visit to	7 Oct	11 Oct	UPC,	Study visit to UPC Barcelona-Tech Barcelona included:	3 retrained UoM
	UPC	2013	2013	ES	- Visits related to course development (Figure 4.),:	teacher
	Barcelona-				Course "Energy efficiency on public buildings" - Visit to Sant	2 workshops
	Tech,				Cugat Campus (Low energy buildings, Living buildings, research	3 visits to examples of
	Barcelona, ES				projects, Visit to Anella Verda, Secretariat of the Union for the	good practice
					Mediterranean) Course "Sustainability Indicators at local and regional level" -	
					Visit to 22@, Barcelona	
1.1.4.	Study visit to	8 Dec	12 Dec	KTH,	Education of 2 UoM representatives (5 days workshop) in:	2 retrained UoM
	KTH,	2013	2013	SE	- Participatory Backcasting for Strategic Planning Towards	teacher
	Stockholm, SE				Sustainable Cities (Figure 5.)	5 days workshop
1.2.	Development	Jan	Dec	Partner	Programs for 2 courses were developed by the UoM with	2 workshops
	of training	2013	2013	Countries,	support of EU project partners:	56 participants
	courses			BA, RS, ME	"Renewable Energy-Management" – TU Delft	
					"Energy Efficiency of Public Buildings" - UPC Barcelona	
					Currently teachers of each project partner are adopting these	
					programs and they are developing their own courses.  TU Delft has conducted a workshop on modern teaching	
					method - Micro-training.	
			/		UPC has conducted a seminar on modern teaching methods	
					and pedagogical strategies during the study visit to Barcelona	
					on 7-11 October 2013.	
					UPC has also uploaded on SDTRAIN intranet guides and articles	
		/			devoted to competences for sustainability, pedagogical	
1.3.	Davidonment	N/ou/	Dec	Douboou	strategies and their evaluation.  The EU project partners were developed the course materials	
1.5.	Development of interactive	Mar 2013	Dec 2013	Partner Countries,	training courses and upload them/linked them on the SD TRAIN	
	problem-based	2015	2013	BA, RS, ME	Intranet. UoM project team will transfer these materials to	
	teaching			B, (, 1.3, 14)	Moodle Platform.	
	methods				Teachers of Partner Universities will adopting the course	
	methods		$\mathbf{D}^{\mathbf{T}}$		materials and developing their own once to be uploaded on	
1.4	Davidania			S 2	Moodle Platform.	2 minted heads
1.4.	Development of teaching	May 2013	Feb 2014	Partner Countries,	All training programs are fully covered by adequate teaching materials (presentation, scripts, translation of materials from	2 printed book 2 adapted translation of
	tutorials	2013	2014	BA, RS, ME	EU partners, instruction for software use, etc.). Complete	book (available at
	tutonais	\		<i>Di</i> 1, 113, 1412	teaching materials are available at Moodle platform	Moodle and intranet)
		\			www.sdtrain.ac.me/moodle and at intranet part of project	1 instruction for
		\			web site <u>www.sdtrain.info</u> .	software use (at
		\			Handbooks "Energy Efficiency in Public Building"and	Moodle)
		\			"Renewable Energy-Management" is primary created for	12 on line available
					municipalities' officers, but it will be also used by students of	lectures
		l			University of Montenegro.	

Table 2. WP2. Development of the web-based toolkit

Activity	Activity	Start	End	Place	Description of the activity carried out	Specific and
N°	Title	date	date			measurable indicators
						of achievement
2.1.	Development	Nov	Feb	Partner	Activities were related to creation of efficiently functioning base	1 server
	of the training	2013	2014	Countries,	for development and implementation of the training courses.	40 desktop computers
	infrastructure			BA, RS, ME	Initial phase were included selection, purchase and deployment	2 laptop computers
					of the equipment sufficient for work of the development team	6 projectors
					and implementing the courses. Equipment is located at	4 printers
					University of Montenegro-Faculty of Mechanical Engineering.	1 multifunctional
					Server was used as a hardware base for Moodle platform. Other	centre
					computer equipment was used for training program	1 interactive
					preparation and implementation. Access to server is reserved to	whiteboard
					technical staff of Computer center of University of Montenegro,	
					while the rest of equipment is on disposal to teaching and	
					scientific staff at the University of Montenegro. The same	
					equipment is used for regular activities at the faculty so the	
					indirect beneficiaries are also the students of this faculty.	
2.2.	Development	Dec	Oct	Lead: KTH	UoM worked on the development of the web-platform and	Moodle platform
	of the web-	2013	2013	Test: All	creation of the toolkit as web-based learning environment. For	http://www.sdtrain.ac.
	platform			partners	this propose Moodle platform was used.	me/moodle/login/inde
	_				All developed courses are available on this platform, including	<u>x.php</u>
					course descriptions, assignments, teachers support, lectures,	
					which the trainees can use online and download. The platform	
					contains an extensive library with suggestions for further	
					reading for each course. Key lectures and materials from EU	

					partners show energy and environmental technology applications. Trainees have a possibility to upload their own reports and discuss issues around the reports with colleagues in the same group using web-forum. The toolkit facilitated communication during implementation of the courses.  The Moodle platform makes it possible to:  - Conduct a training for groups of trainees of different sizes  - Allow participants to co-present and enabling involvement of guest professors, speakers or multiple trainers from multiple locations  - Answering questions from trainees publicly or privately using the chat tool, and save the text from the chat for later use as support.	
2.3.	Development and publishing online courses and materials	May 2013	Feb 2014	All partners	This activity is closely related to activity 1.4. All teaching materials are available at Moodle platform	2 printed book 2 adapted translation of book (available at Moodle) 12 on-line available lectures

Table 3.WP3. Piloting the courses at partner universities in Serbia, Montenegro and BiH

Activity N°	Activity Title	Start date	End date	Place	Description of the activity carried out	Specific and measurable indicators of achievement
3.1.	Implementatio n of 10 training courses in cooperation with EU teachers	Sep 2013	June 2014	All partners	UoM implemented two training programs:  - Energy Efficiency in Public Buildings (piloted at the University of Montenegro in computer hall equipped with the Tempus project SD TRAIN). Training program include pilot workshop, with short presentation of the prepared teaching materials and intensive education on Moodle platform (http://www.sdrain.ac.me/moodle/login/index.php). Term of workshop was February 5 <sup>th</sup> 2014. (Figure 6.)  - Renewable Energy-Management (Implemented at the University of Montenegro in computer hall equipped with the Tempus project). Training program include workshop and intensive work on education of users of Moodle platform. Term of workshop was October 10 <sup>th</sup> 2014. (Figure 8.)	2 workshops 47 participants
3.2.	Developing recommendati on. for capacity building of public author.	Mar 2013	July 2014	All partners	Significant part of Letter of Intent between University of Montenegro and Union of Municipalities is concerning to develop of recommendations for capacity building of public authorities in this sector.	Letter of Intent

Table 4.WP4:Communication and dissemination of the project results

Activity Activity N° Title	Start date	End date	Place	Description of the activity carried out	Specific and measurable indicators of achievement
4.1. Developm of Communic n and Disseminat Strategy	2012 tio	May 2014	All partners	Communication and Dissemination Strategy for SDTRAN Project in University of Montenegro was prepared. This document includes dissemination objectives and strategy, project stakeholders and communication plan, dissemination tools and materials, publication and communication of results.  Separate document was prepared with the list of all dissemination activities carried out. This list includes dates of dissemination activities, target groups, type of event and brief description.  The Final Conference organized in premises of University of Montenegro on May 12 <sup>th</sup> 2015 (Figure 9.). The Conference summarized and disseminated results of the project. The Conferences brought together representatives from academic community and public authorities.  The project was finished with final dissemination activities on May 31th 2015 at municipalities Bijelo Polje during the opening ceremony SHHP Vrelo and the grand opening of works on SHHP	Document: Communication and Dissemination Strategy for SDTRAN Project in University of Montenegro Document: Realized Dissemination Activities for SDTRAIN Project in UoM 2 workshops 1 final conference, 12/05/2015 5 meetings 2 presentations

					management of renewable energy sources in the north of Montenegro, which is less developed part of the country. The event was attended by more than 200 stakeholders (mayor of Bijelo Polje, Director of the Directorate for Sustainable Development, employees of local administrations, the delegation of the Chamber of Engineers, representatives of the business sector (Figure 10).	
4.2.	Development of the project website	Nov 2012	Sep 2014	Lead: KTH Updates: all partners	UoM informed KTH about all project activities, and sent all materials appropriate to be updated at project website.	www.sdtrain.info
4.3.	Information and publicity campaign for training programme	Mar 2013	June 2014	All partners	Information and publicity campaign for training programme was done by providing adequte information material and its dissemination by Union of Municipalities of Montenegro.  The project was presented at Energy days of Podgorica at May2014 (Figure 7).  The project promotion handouts were produced to enhance project visibility (T-shirts, USB memories, notebooks, pens, etc.).	Project poster & Booklet Leaflets in Montenegrian Conference paper Conference presentation T-shirts Notebooks USB memories Pens & Bags

Table 5.WP5: Sustainability actions

Activity N°	Activity Title	Start date	End date	Place	Description of the activity carried out	Specific and measurable indicators of achievement
5.1.	Development	Dec	May	All partners	Sustainability Plan for SDTRAN Project in University of	Document:
	of	2012	2015		Montenegro was created. This document includes risk analysis	Sustainability Plan for
	sustainability	/	7		of the developed courses, legal aspects, external partners and	SDTRAN Project in
	plan	/	_ / \		collaborations, financial aspects, potential of possible joint	University of
	*	/	- / · ·		collaboration with societal partners, as well as other aspects	Montenegro
		/			which you consider important for the courses sustainability.	Letter of Intent signed
		/	/			Union of Municipalities
			/	1 1 1 1		Montenegro, and
			5.0			Faculty of Mechanical
			4_4			Engineering
5.2.	Multistakehold	Feb	May	All partners	Based on recommendations on developing capacities of the	Letter of Intent signed
	ers meetings	2013	2015		public workers in creation and operation of sustainable public	by Secretary General of
	and seminars			2/ ///	infrastructure, the agreements on further activities between	Union of Municipalities
		\			UoM and local authorities as a base for the training activities	Montenegro, and Dean
		\			after the project end were established. Letter of Intent was	of UoM-Faculty of
					signed.	Mechanical Engineering

Table 6.WP6. Quality control and monitoring

Activity N°	Activity Title	Start date	End date	Place	Description of the activity carried out	Specific and measurable indicators of achievement
6.1.	External quality control by Reference team and external experts	Apr 2013	May 2015	Partner countries	The quality control and monitoring as well as quality assurance is very important part of realisation and strategy of the project. Each process and outcome has been carefully planned, performed and checked (and in some case corrected). National Tempus Office undertook a field monitoring visit to the project (external control) on April 04 <sup>th</sup> 2013 at University of Montenegro.	1 external quality control
6.2.	Permanent control by the project local Coordinators	Oct 2012	May 2015	Partner countries	Periodically UoM project team had a meeting to evaluate project results.	Minutes of meeting
6.3.	Permanent control by the project Coordinator and Steering Committee	Oct 2012	May 2015	Coordinator  – KTH, all partners		

Table 7. WP7: Management of the project

Activity	Activity	Start	End	Place	Description of the activity carried out	Specific and
N°	Title	date	date			measurable indicators

					of achievement
7.1.	Coordination meetings	Oct 2012	Oct 2014	UB, KTH, UPC	
7.2.	Development of the management intranet	Nov 2012	Jan 2013	All partners	
7.3.	Project management by the project coordinator, Steering Committee	Oct 2012	Oct 2014	All partners	



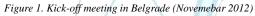




Figure 2. Study visit to the TU Delft (February 2013)



Figure 3. Study visit to KTH Stockholm (May 2013)



Figure 4. Study visit to UPC Barcelona (October 2013)



Figure 5. Training of teachers about Backcasting methodology on KTH Stockholm (December 2013)



Figure 6. First training course "Energy Efficiency in Public Buildings"at the University of Montenegro (February 2014)



Figure 7. Presentation the results of project at Energy day of Podgorica (May 2014)



Figure 8. Second training course "Renewable Energy-Management"- University of Montenegro (October 2014)



Figure 9. Final Conference SDTRAIN in Podgorica (May 2015)



Figure 10. Final dissemination event of the SDTRAIN in Montenegro (31th May 2015)

### **CONCLUSIONS**

# SDTRAIN wider objective:

To establish system for training of public authorities aimed at improving level of environmental expertise, facilitating good governance and sustainable infrastructure development in Western Balkan countries.

# **SDTRAIN** specific objectives:

- To develop training programme for capacity building of staff of public authorities in sustainable development, particularly energy efficiency in the cities, municipal sustainable infrastructure and good governance at partner Universities in Montenegro, Serbia and in Bosnia and Herzegovina cooperation with Associations of Local Authorities of these countries
- To improve capacities of partner Universities in providing training in sustainable public infrastructure through retraining of the key teachers at EU universities
- To develop a web-based toolkits as an interactive learning environment for training of public authorities
- To implement training programme in cooperation with EU teachers by October 2014
- To develop recommendations for capacity building of public authorities in sustainable infrastructure and securing continuous update of their knowledge, skills and competencies
- To ensure continuity of the training Programme and the web toolkit beyond Tempus Programme funding.

Based on the contents of the paper can be concluded that all SDTRAIN specific objectives are met.

### **Outcomes:**

- Preparation of tutors, development of training courses, teaching tutorials and teaching methods for training of public services in sustainable infrastructure development at partner Universities
- Development of web-based Toolkit for training programme
- Piloting of Training Courses
- · Communication and dissemination of the project results
- Sustainability Actions
- · Quality Control and Monitoring
- Management of the Project

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